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Valley Water Management Company Technical Evidence and Edison Oilfield Subsurface Investigations Phase 2 Final Report

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Table of Contents

List of Tables

List of Figures

List of Appendices

Executive Summary

This *Technical Evidence and Phase 2 Subsurface Investigation Final Report* (Report) has been prepared by Kennedy/Jenks Consultants (Kennedy/Jenks) on behalf of Valley Water Management Company (Valley Water). This represents the final report required by a 13267 Order issued to Valley Water on 1 July 2014 as well as Valley Water's evidence to rebut the allegations contained in the proposed Cease and Desist Order (CDO) and the Prosecution Team's Opening Submission of June 12, 2015.

In addition to other information, the findings of two phases of subsurface investigations are presented. Observations regarding the fate and transport of salinity constituents in produced water are developed based on available information including:

- Direct results of the Phase 1 and Phase 2 subsurface investigations of deep and shallow groundwater. Portions of the technical work were conducted by Kenneth D. Schmidt and Associates; Dee Jaspar and Associates; Stuart Childs and Gary Carlton, Kennedy/Jenks; Jim Waldron, Valley Water; and their associates and subcontractors.
- Additional sampling and analysis of groundwater from eight wells installed as part of the investigations
- Sampling and analysis of off-site wells in the vicinity of Race Track Hill
- Review of historical flows discharged to the Fee 34 Facility and Race Track Hill.

Figures 1, 2, and 3 show the locations of the facilities addressed in this report.

Fee 34 Facility

This 3.4 acre Facility is permitted as an oilfield produced water collection and treatment facility near Edison, California. The Facility is located in the active production area of the Edison Oil Field. Produced water from a number of small, independent oil leases in the Edison Oil Field is transported to the facility by pipeline and flows into gunite-lined ponds where crude oil is skimmed from the water. The treated produced water is then pumped to the Race Track Hill Facility and into unlined sumps and onto irrigation areas.

Subsurface investigations included collection and analysis of soil samples to 200 feet below ground surface (bgs); installation and sampling of a groundwater monitoring well screened at a depth of 395 to 435 feet bgs; and leak testing of two of the lined ponds used for produced water treatment.

Soil Boring. A soil boring was advanced at a location 10 feet from an unlined skimmed oil pond and within 30 feet of the produced water treatment ponds. Samples were collected and analyzed for water content, EC, boron, chloride, and Total Petroleum Hydrocarbons as crude oil (TPHc). No perched water was encountered while advancing the boring and none of the measured results for water content gave any indication of accumulation of percolating water or groundwater. TPHc concentrations were not detected at any depth below 5 feet bgs where the concentration was 220 mg/kg, well below the environmental screening level of 500 mg/kg. In addition, no elevated EC levels or concentrations of boron or chloride were observed in the soil boring samples. The result of this evaluation was documentation that neither water nor the constituents commonly found in produced water were encountered at elevated levels in the unsaturated zone beneath the Fee 34 Facility. This corroborates the finding of a May 1996 soil boring study that also showed no evidence of produced water movement in the unsaturated zone.

Monitoring Well Installation and Sampling. Groundwater monitoring well C-1D was installed adjacent to the produced water treatment and storage ponds and sampled in early 2015. At the time of sampling, the water level was 298.4 feet bgs. Water chemistry of the sample collected documented low levels of boron, chloride, and EC. More detailed analyses of a larger suite of constituents demonstrated that the characteristics of the groundwater have not been influenced by produced water from the Fee 34 Facility.

Leak Testing of Two Produced Water Treatment Ponds. A Spring 2014 initial round of leak testing of the gunite-lined ponds indicated that the estimated range of pond seepage was 0.3 to 3.3 mm/day for the South Pond and 3.3 to 5.5 mm/day for the North Pond. These initial leak tests were undertaken during non-ideal meteorological conditions solely for the purpose of obtaining an indication as to whether any major seepage was occurring from these ponds. As stated in the Phase 1 Report, more precise and accurate results would be obtained by conducting tests during rain-free periods between December and February, when errors due to the measurement of evaporation are minimized. These initial pond seepage values are quite low and, as stated above, there is no indication from the soil boring and groundwater monitoring well datasets that any minor seepage that may have occurred has reached groundwater.

Fee 34 Facility Summary. The most important finding was the water quality analysis of groundwater from monitoring well C-1D that taps first encountered groundwater beneath the Fee 34 Facility. Water quality of this well indicates that groundwater beneath the Facility does not have elevated concentrations that would indicate the influence of produced water. This conclusion is supported by the lack of water or elevated zones of produced water constituents in the unsaturated zone from both the 1996 and 2014 investigations.

Race Track Hill Facility (RTH)

This Facility consists of 240 acres located approximately four miles northeast of the Fee 34 Facility. There are 27 unlined surface impoundments used for produced water percolation and evaporation. Tamarisk trees (also known as Salt Cedar) were planted around the percolation ponds in 1960 to increase evaporative water loss by transpiration. There are approximately 91 acres with sprinkler irrigation systems that are used to apply produced water to salt-tolerant local grasses and some shrubs.

Eight groundwater monitoring wells have been installed and sampled at this Facility. Three wells are completed in deep groundwater and five are completed in shallow groundwater. Four existing off-site wells have also been sampled. Samples from four soil borings have been analyzed for produced water constituents to characterize unsaturated zone conditions. Finally, an evaluation of produced water percolation at RTH has been conducted.

Soil Borings. A dataset of soil EC and concentrations of boron and chloride were collected to determine whether long-term produced water irrigation has affected soil salinity. The results summarized in this report indicate that boron accumulates in the surface three feet of soil under irrigated conditions. There are some apparently random peaks for measured constituents at various depths in the soil profiles, but effects specific to the irrigated area boring other than boron cannot be identified. There is no indication of salt (EC or chloride) accumulation in the irrigated area at RTH.

Groundwater Flow. Water level measurements for the five shallow groundwater wells show that there is a groundwater flow gradient to the northeast on the east side of RTH. In addition, the water levels in wells on the upper portion of RTH indicate that there may be a groundwater mound in the shallow groundwater.

The deep groundwater flow direction is indicated to be to the north-northwest based on March 2015 measurements. The water level elevations do not indicate a groundwater mound in the deep groundwater.

Groundwater Quality. Groundwater quality information was collected for three sets of wells: shallow groundwater at or near RTH, deep groundwater at RTH, and nearby off-site wells:

- Three of the shallow groundwater wells (RTH-1, 4, and 6) installed near evaporation/ percolation ponds have groundwater chemistry that appears to be affected by produced water. A fourth well installed at the eastern base of RTH (RTH-3) has unique water chemistry, primarily due to high sulfate concentration. The fifth shallow well (RTH-5) was installed east of RTH near Cottonwood Creek to determine whether produced water had moved off-site in that direction. Water quality results indicate that this well has not been influenced by produced water.
- Three deep groundwater wells installed on RTH (RTH-7D, 8D, and 9D) represent two types of groundwater quality. Water from the well at the base of the northeast corner of RTH (RTH-8D) shows groundwater mixed with produced water. The remaining two wells, on the western side of the site, (RTH-7D, 9D) have some indication that irrigation with produced water has mixed with local groundwater with high sulfate concentrations.
- Four off-site wells near RTH were sampled to assess whether off-site effects of produced water could be documented. Two wells (24J and 12F) were sampled along Cottonwood Creek, one upstream of the location where Breckenridge Road crosses the creek and one downstream. These two wells have water quality very similar to the shallow groundwater monitoring well near Cottonwood Creek (RTH-5) and none of them show any water quality effects related to produced water percolation at RTH. The lack of mixing at the downstream shallow well is an important finding because it documents that, at this location, there is no groundwater impact or imminent threat to groundwater.

  One of the remaining two off-site wells is northwest of RTH and the other is southwest of RTH. Neither of these wells has water quality that suggests mixing with produced water. Considering the locations of water supply wells, none are directly downgradient of the Race Track Hill Facility in terms of the direction of deep groundwater flow. This also indicates that there is no imminent threat to groundwater.

Produced Water Flows to Race Track Hill. Records of produced water flows were compiled for 1960 through 2014. This dataset was used to calculate the total volume of produced water pumped to RTH over 54 years of record. A water balance for RTH was developed to determine the amount of produced water evaporated from the evaporation/percolation ponds and lost by evapotranspiration from the Salt Cedar trees and the irrigated areas. The total volume was 8,350 million gallons (MG) and combined evaporative losses were calculated to be between 45 and 49 percent of the total volume: approximately 3,750 – 4,120 MG. Of this total, approximately 60 percent of total evaporative loss was from evapotranspiration at the irrigated areas. The practice of irrigating salt tolerant grasses and shrubs is an important part of water management at RTH. Aerial photographs of the facility show the beneficial impact on vegetation growth.

The net seepage of produced water to the subsurface at RTH is calculated to be 4,200 – 4,600 MG (12,900 - 14,100 Acre-feet). After accounting for the porosity of the sediments beneath RTH, the total volume needed to store this volume of water would be 43,000 – 47,000 Acre-feet. This amount of sediment would occupy about 200 feet of thickness beneath a 200 acre area.

It should also be noted that the produced water flows from 1960 to 1968, were higher and were applied to a much smaller land area than is used today. The combination of high flows and small land area would result in more percolation. It is likely that produced water reached groundwater during this period prior to the adoption of California's Antidegradation Policy. In fact, it can be presumed that after the initial 8 years of saline produced water discharge via percolation, that by 1968, the underlying ground water reflected mixing with produced water and was not high quality water based on EC or TDS, chloride, or boron concentrations.

Another facet of the produced water flows sent to RTH is the potential for runoff of produced water or produced water constituents deposited in the soil. Valley Water had no evidence of runoff from RTH even from the very large storm event in late December of 2010, so aerial photographs taken between 1992 and 2015 were reviewed for RTH and the Cottonwood Creek area to determine whether signs of erosion or runoff could be documented. The aerial photographs provide evidence that the landscape does not show changes related to erosion and there is no evidence of vegetative growth that would be caused by surface water runoff. In addition, survey work was undertaken at RTH to confirm the adequacy of pond storage and freeboard, drainage ditches and catchment basins to contain produced water and unusual precipitation events on site. During the course of this field work, the trained survey crew has not observed signs of sheet erosion or sediment rills. The existing configuration of ponds, ditches, and catchment basins is adequate to prevent run-off from the Race Track Hill Facility.

Conclusions of the Technical Evidence and Phase 2 Final Report

Valley Water operates an oil field produced water treatment facility and a disposal facility in the Edison Oil Field. Both were evaluated as part of the technical studies reported here:

Fee 34 Facility. The most important finding was the water quality analysis for groundwater underlying the facility. This dataset indicates that underlying groundwater does not have elevated concentrations that would indicate the influence of produced water. This facility has not impacted groundwater; therefore, no further investigations are proposed.

Race Track Hill Facility. At the Race Track Hill Facility, produced water is applied to 27 evaporation/percolation ponds and 91 acres of sprinkler irrigated vegetation. Groundwater studies indicate mixing of produced water and groundwater in the shallow groundwater at the site. There is less mixing of produced water in the deep groundwater at the site. Water quality data collected from four off-site water supply wells and one off-site monitoring well indicate no effect of produced water on groundwater quality.

The final conclusions all reiterate that there is no imminent threat of harm to soil, off-site groundwater users, or surface waters from Valley Water's activities at the Facilities.

Section 1: Introduction

This *Technical Evidence and Phase 2 Subsurface Investigation Final Report* (Report) has been prepared by Kennedy/Jenks Consultants (Kennedy/Jenks) on behalf of Valley Water Management Company (Valley Water). The Report summarizes the Phase 1 and 2 subsurface investigation results for Valley Water's Edison Oil Field Facilities, Race Track Hill and the Fee 34 Facility (also known as the C Plant). The shallow subsurface investigations and reports were conducted by Kennedy/Jenks (Appendix A, Appendix B) and deep subsurface investigations were conducted and reported by Kenneth D. Schmidt and Associates (KDSA, 2015; Appendix C). Research to identify off-site wells was conducted by Dee Jaspar and Associates (DJA). Laboratory results for wells that were sampled are included in Appendix D. Other analysis was provided by Stuart Childs and Gary Carlton of Kennedy/Jenks, Jim Waldron, and other associates and consultants.

This summary report provides a synthesis of the findings of both the Phase 1 and Phase 2 Subsurface Investigations. Phase 1 results have been summarized previously in the *Phase 1 Subsurface Investigation Report* (Kennedy/Jenks, 2014b) and Phase 2 shallow investigations were reported in the *Interim Report on Phase 2 Subsurface Investigations* (Kennedy/Jenks, 2015a; Appendix A) and the well completion report (Kennedy/Jenks 2015b; Appendix B).

Observations regarding the fate and transport of salinity constituents in produced water are developed based on available information including:

- The direct results of the Phase 1 and Phase 2 subsurface investigations
- Additional sampling and analysis of groundwater using the wells installed as part of investigations
- Sampling and analysis of off-site wells in the vicinity of Race Track Hill
- Review of historical flows to the Fee 34 Facility and Race Track Hill as well as an evaluation of percolation and evapotranspiration.

1.1 Background

Valley Water is a non-profit corporation that provides produced water treatment and management services to small independent oil producers in the Edison Oil Field. The Fee 34 and Race Track Hill Facilities are owned and operated by Valley Water (Figure 1).

1.1.1 Description of the Fee 34 Facility

The Fee 34 Facility covers 3.4 acres (Assessor's Parcel Number 388-050-254 in the southwest quarter of the southwest quarter of Section 34, T29S, R29E, MDB&M) and is an oilfield produced water collection, treatment, and shipping facility located approximately one mile northeast of the community of Edison. The Fee 34 Facility operates under California Regional Water Quality Control Board, Central Valley Region (CVRWQCB) Waste Discharge Requirements (WDR) Order No. 92-11037, a Notice of Applicability for General Order No. 92-110. There are six surface impoundments at the facility (Figure 2). Produced water is transported to the facility by pipeline from various small, independent oil leases throughout the

Edison Oil Field. Produced water flows into two gunite-lined ponds where a skimming process is used to remove any remaining crude oil. Water then flows through adjustable weirs into a larger lined pond (the shipping pond) on the west side of the property. The treated produced water is then pumped from the shipping pond to the Race Track Hill Facility for percolation from unlined sumps, irrigation, and evaporation.

1.1.2 The Race Track Hill Facility

The Race Track Hill site consists of 240 acres (Assessor's Parcel Number 387-060-031) in the northwest quarter, and the north half of the southwest quarter of Section 24, T29S, R29E, MDB&M, approximately four miles northeast of the Fee 34 Facility in an area of steep and rolling topography in Kern County (Figure 3). There are 27 unlined surface impoundments used for produced water percolation and evaporation. Tamarisk trees (*Tamarix* spp.), also known as Salt Cedar) were planted around the original 17 percolation ponds in 1960. This facultative phreatophyte species (Zouher, 2003) is capable of extracting considerable water from shallow water tables and can tolerate high salinity levels. This type of vegetation was planted at Race Track Hill to provide additional evapotranspiration of water from the ponds.

The site utilizes approximately 91 acres for irrigation by sprinkler irrigation systems to apply produced water to salt-tolerant local grasses and some shrubs that have been planted in the irrigation areas at Race Track Hill. Produced water flow from the Fee 34 Facility enters Race Track Hill at a netted pond located at a high elevation with respect to the rest of the facility. Gravity is used to distribute produced water to evaporation/percolation ponds and spray irrigation areas to aid in water loss by evapotranspiration. The Race Track Hill Facility operates under WDR Order No. 58-349.

1.1.3 Climate Information

Reference evapotranspiration (ET0) data for the area were collected from the California Irrigation Management Information System (CIMIS) Arvin-Edison Station 125. Annual ET0 totals 61.1 inches with data ranging from an average of 1.4 inches in December and to an average of 9.1 inches in July based on a dataset from 1995 to 2015 (CIMIS, 2015).

Rainfall data for the area were collected from the Western Regional Climate Center (WRCC) database for the Bakersfield Airport WSO, Station 040442. Average annual precipitation at this station is 6.11 inches (WRCC, 2015). The 100-year return annual total precipitation was calculated using the probability distribution of annual precipitation from 1938 to 2014. The 100-year return period annual precipitation is 14.6 inches. The 100-year, 24-hour storm event is 3.00 inches (Appendix F).

A basic hydrologic analysis was performed to determine maximum historic precipitation events that have occurred in the area. Based on data obtained from the Bakersfield Airport WSO station, the maximum 30 day total precipitation on record was 5.98 inches from 5 December 2010 through 3 January 2011 based on a daily period of record from 1938 – 2015. The maximum 7 day total precipitation on record was 4.58 inches from 17 December 2010 through 23 December 2010. Note that the wettest 7 days on record were during the wettest month on record. The maximum one day rainfall on record was 2.29 inches on 9 February 1978.

1.2 Regulatory History

The regulatory history of the Valley Water produced water management areas can be summarized as follows:

- 18 September 1958 – Waste Discharge Requirements (WDRs) were issued to Valley Water's Race Track Hill Facility by the Regional Water Board through Res. No. 58-349. (CVRWQCB, 1958).

- 8 April 1991 **-** The Regional Board requested a Technical Report/Report of Waste Discharge for oilfield produced water facilities in the Edison area of Kern County. (CVRWQCB, 1991.)

- 21 June 1991 **–** Valley Water provided the information requested in the Regional Board's 8 April 1991 letter, but informed the Regional Board that the Race Track Facility was covered by WDRs.

- 29 May 1992 – WDRs were issued to Valley Water's Fee 34 Facility in the Edison Oil Field through a Notice of Applicability to be covered under General Order No. 92-110. (CVRWQCB, 1992).

- 24 May 1996 – Valley Water's predecessor submitted a report in accordance with Order No. 92-110, which required a plan be submitted for achieving compliance with that Order. One compliance pathway was to "demonstrate to the Board in a public hearing that the proposed discharge will not substantially affect water quality or cause a violation of water quality objectives in accordance with Resolution No. 82-136." On this date, a report entitled "Drilling and Data Acquisition Report" was submitted to the Regional Board in order to prove that the Fee 34 facility "does not pose a threat to ground water quality and that no further action should be required for continued operation of the site." In this same submittal, a public hearing was requested, but no hearing was ever granted by the Water Board to allow for this demonstration to be made under the WDRs (Kennedy/Jenks Consultants, 1996).

- 16 August 1996 – In a Regional Board inspection report on this date, the Regional Board acknowledged that "Valley Waste Disposal recently submitted a report, *Drilling and Data Acquisition Report,* to demonstrate that the C-Plant (Fee 34) will not affect water quality. The report is currently being reviewed."

- 20 June 2012 – The first inspection reports to indicate any violations. Valley Water implemented modifications to the facilities (e.g., netting of ponds) to address several of the issues.

- 28 June 2012 – First Notice alleging violation at the Fee 34 Facility since 1992 related to sumps not being netted to exclude wildlife. A similar notice was sent to the Race Track Hill Facility on July 10, 2012.

- 23 July 2013 – CVRWQCB letter to Valley Water stating its intention to update the WDRs for all surface water impoundments for oil field produced water. This notice also requested specific information about the facilities and discharges. (CVRWQCB, 2013a)

- 9 October 2013 – Valley Water and Kennedy/Jenks met with CVRWQCB staff and a representative of the State Water Quality Control Board legal staff.

- 10 October 2013 – Valley Water was issued a Notice of Violation (NOV) for the Race Track Hill Facility claiming that the irrigation water being applied to land violated the WDRs, even though previous inspection reports had never deemed this activity to be a violation and it does not violate the plain terms of the permit. (CVRWQCB, 2013b). A NOV for the Fee 34 Facility was also issued on this date claiming insufficient freeboard in the ponds and alleging for the first time that high salinity wastewater poses a threat to groundwater (CVRQCB, 2013c).

- 8 November 2013 – Valley Water provided responses to both of the October 2013 NOVs (Valley Water, 2013).

- 14 January 2014 – At Valley Water's request, CVRWQCB staff met with Valley Water and their consultants to discuss the voluntary Phase 1 Subsurface Investigation at both facilities proposed by Valley Water.

- 5 February 2014 – Draft Cleanup and Abatement Orders (CAOs) for each of the facilities were sent to Valley Water for review and comment (CVRWQCB, 2014a).

- 13 March 2014 – *Phase 1 Work Plan for Subsurface Investigations at the Fee 34 Facility and Race Track Hill Area* was submitted to the CVRWQCB (Kennedy/Jenks, 2014a). Phase 1 investigations were developed based on requirements in the Draft CAOs and the intent was to characterize vadose zone and groundwater conditions beneath the Race Track Hill and Fee 34 Facilities and to provide an initial assessment of potential impacts of oil field produced water storage and discharge on underlying groundwater and soil. The Phase 1 investigations were conducted on a voluntary basis but under the guidance of the CVRWQCB.

- 4 April 2014. CVRWQCB email response to the Work Plan stating that the scope of the Phase I Work Plan seemed adequate.

- 1 July 2014 – A 13267 Order was issued to Valley Water in lieu of the draft CAOs (CVRWQCB, 2014b). The Order required that all additional field investigations be completed by 15 January 2015.

- 31 July 2014 - Valley Water appealed the terms of the July 2014 13267 letter to the State Water Board due to the unreasonable timeframes that could not be reasonably met. No response to this petition for review was received, except an acknowledgement of filing.

- 1 August 2014 - *Phase 1 Subsurface Investigation Report at the Fee 34 Facility and Race Track Hill Area* submitted to CVRWQCB (Kennedy/Jenks, 2014b). This included a proposal for Phase 2 investigations.

- 2 October 2014 – At Valley Water's request, Valley Water met with CVRWQCB to discuss the Phase 1 report and propose Phase 2 investigations.

- 10 November 2014 – Phase 2 Investigation Work Plans were submitted to the CVRWQCB (Kennedy/Jenks, 2014c; KDSA, 2014).

- 15 January 2015 – *Interim Report on Phase 2 Subsurface Investigations* was submitted to the CVRWQCB (Kennedy/Jenks, 2015a). This report included preliminary results for the shallow aquifer investigations.

- 1 April 2015 **–** The Regional Board issued a Water Code section 13267 Order requiring collection and analysis of wastewater samples from each of the ponds listed, including those at the Fee 34 and Race Track Hill Facilities (CVRWQCB, 2015a).

- 30 April 2015 - A draft Cease and Desist Order (CDO) was provided to Valley Water for comment. Valley Water provided detailed comments on May 11, 2015, and respectfully requested that the CVRWQCB defer issuance of any further enforcement orders until the results of the Phase II Workplan were submitted in the near future.

- 1 May 2015 – Valley Water receives NOV in response to the Phase 2 results included in the Interim Report submitted 15 January 2015 (CVRWQCB, 2015b).

- 18 May 2015 – Tentative CDO was issued for the Race Track Hill Facility and Fee 34 Facility (CVRWQCB, 2015c).

- 15 June 2015 - Valley Water submitted technical information requested in the April 1, 2015 13267 Order (Valley Water, 2015).

- 30 June 2015 – Evidence submitted to CVRWQCB in preparation for hearing on 31 July 2015 (Downey Brand, 2015).

Section 2: Phase 1 and Phase 2 Investigations

This section provides a summary of all investigations at the site. In Section 3, further analysis is provided to combine available information for the sites.

During conversations among Valley Water, its consultants, and CVRWQCB staff and managers in 2013 and 2014, it was agreed that the investigations at both sites would be undertaken using a phased approach. A phased approach is most efficient for site investigations such as those conducted because results of one phase can be used to allow informed decisions regarding the next phases of investigations. Approval of and support for the phased approach are documented in submitted work plans and reports as well as in draft and final regulatory orders from CVRWQCB.

2.1 Shallow Groundwater Investigations

The Phase 1 shallow investigations were conducted to provide an initial assessment of the potential influence of oilfield produced water on underlying soil and shallow groundwater (Kennedy/Jenks, 2014b). The Phase 1 investigations at the Fee 34 Facility included: a) a deep soil boring to determine subsurface lithology, presence of moisture, and depth profiles of key constituents of produced water; and b) leak testing of the lined ponds. At the Race Track Hill Facility, four soil borings were advanced and monitoring wells were installed and sampled at three of the boring locations (Figure 3).

Phase 2 shallow groundwater investigations were conducted based on the results of Phase 1 to provide further assessment of shallow groundwater conditions at the Race Track Hill Facility (Kennedy/Jenks, 2014c). The investigations at the Race Track Hill Facility included installation and sampling of two additional shallow monitoring wells (RTH-5 and RTH-6) in assumed downgradient locations (Figure 3) to augment the three shallow monitoring wells installed during Phase 1.

Results for the Phase 1 shallow investigations were submitted to the CVRWQCB on 1 August 2014 (Kennedy/Jenks, 2014b). Preliminary results for the Phase 2 shallow groundwater investigations (Interim Report) were submitted to the CVRWQCB on 15 January 2015 and are included in this report as Appendix A (Kennedy/Jenks, 2015a; Appendix A). The Shallow Monitoring Well Installation Report is included as Appendix B of this report (Kennedy/Jenks, 2015b; Appendix B).

2.1.1 Fee 34 Facility Field Work and Results

At the Fee 34 Facility, a soil boring was advanced to 200 feet below ground surface (bgs) at a location 10 feet from the unlined skimmed oil ponds and within 30 feet of the produced water treatment ponds (Figure 2). Samples were collected at 5 foot depth increments to 50 feet below ground surface (bgs) and then every 10 feet to 200 feet. The boring log (Kennedy/Jenks, 2014b) shows that the dominant texture of the subsurface material was well graded sand with granitic gravel, with a smaller portion composed of silty sand. No distinct clay layers were observed, but silt to sandy silt was encountered from 48.5 to 56 feet bgs, and from 88 to 90 feet bgs. No perched water was encountered while advancing the boring. The measured results give no indication of accumulations of percolating water and no groundwater was encountered in the 200 foot boring.

At all depths between 10 and 200 feet, Total Petroleum Hydrocarbons as crude oil (TPHc) concentrations were below the detection limit, 20 mg/kg. The sample collected at 5 feet bgs had a TPHc concentration of 220 mg/kg, well below the environmental screening level of 500 mg/kg (San Francisco Bay Regional Water Quality Control Board, 2013).

No high EC levels or concentrations of boron or chloride were observed in the soil boring (Figure 4). As stated previously, no perched water was encountered while advancing the boring. Soil materials were observed to be dry in the sandy material above these finer-grained layers giving no indication of subsurface movement of water in the unsaturated zone beneath the facility. This is consistent with the results of soil borings taken beneath the Fee 34 Facility nearly 20 years ago in 1996 (Kennedy/Jenks, 1996).

Leak tests were conducted for two of the three lined ponds (North Pond and South Pond) at the Fee 34 Facility to evaluate whether produced water may be seeping through the gunite-lined ponds. The procedure used, based on the techniques of Luhdorff and Scalmanini (2012) and Ham and Baum (2002, 2009), made use of precision monitoring of pond water levels and monitoring of microclimate variables required to calculate pond evaporation rate. These initial tests were conducted during the warm season, late April and May, when errors that are part of measuring the microclimate variables (air temperature, relative humidity, pond surface temperature, and wind speed) are largest. Therefore, it is recommended practice to make leak test measurements during the winter months when evaporation is lowest to get the best accuracy. The initial tests were conducted recognizing that the results might not be sufficiently accurate to precisely assess the low levels of seepage anticipated.

The results of these tests show that the apparent seepage rates of the North Pond and the South Pond average 4.4 millimeters per day (mm/day) and 1.8 mm/day, respectively. The range of uncertainty around these average values was evaluated using two standard deviations based on the 15 minute readings. Using the measured uncertainty for the South Pond, the result of the test ranges from 0.3 to 3.3 mm/day. The uncertainty for the North Pond ranges from 3.3 to 5.5 mm/day. The North Pond test was expected to have additional error associated with the results due to the precipitation events that occurred during the test period and the uncertain accuracy of the precipitation gauge. The average seepage rates measured for the North Pond (approximately 500 gallons per day), range from 380 to 620 gallons per day. The range in uncertainty around the average value of approximately 200 gallons per day from the South Pond is 30 to 370 gallons per day. These initial estimates of seepage indicate that there are not large water losses from the ponds, but the overall accuracy does not allow a final determination of seepage rate.

2.1.2 Race Track Hill Field Work and Results

Soil Borings. As part of the Phase 1 investigations, four soil borings were advanced at the Race Track Hill Facility in April 2014 (Kennedy/Jenks, 2014b). Two of the borings were in the central swale adjacent to the percolation ponds (Figure 3). RTH-1 was in an irrigated area and RTH-2 was in an adjacent unirrigated area. Two more borings were advanced at the base of the swale on the east side of Race Track Hill adjacent to Breckenridge Road. RTH-3 was in a south to north trending dry swale along Breckenridge Road just downstream (north) of the central swale and RTH-4 was located in the northern swale below the percolation ponds. RTH-3 and RTH-4 were located in order to provide representative groundwater monitoring wells. Both are in areas with no irrigation and in swales where surface water may occasionally flow.

The boring logs completed at Race Track Hill indicated that much of the lithology consists of silty sand, silty clayey sands, well-graded sands, and poorly graded sands (Kennedy/Jenks, 2014b). The proportions of these materials differed among the borings but, except for RTH-3, the surface materials were silty sands. Some thin, partially consolidated or cemented layers were observed in RTH-1, RTH-2, and RTH-3 but not in RTH-4. At RTH-4, drilling was difficult near the bottom of the boring, likely due to the presence of cobbles. These cobbles may indicate that stream channel deposits are present in the subsurface of the swale where RTH-4 is located. In all borings, there was little moisture noted in the subsurface. Some moisture increase was observed in occasional finer textured layers, but there were no cases in which free water was observed above first encountered groundwater.

EC, chloride, and boron profiles for the four borings are shown in Figure 5. Considerable variability exists in EC versus depth for each boring as well as among the four borings. Three of the borings show zones with higher EC than the average EC. The EC peak for RTH-4 is at 15 feet bgs; EC peaks in RTH-1 between 30 and 40 feet bgs, and RTH-3 peaks at 90 to 100 feet bgs. Each of these zones is in finer textured zones and RTH-3 is in the saturated zone. The boron soil profiles do not show peak concentrations at the same depths as EC. The only elevated boron zone occurs in RTH-1 in the surface 3 feet of soil. RTH-1 also has a chloride increase in a finer textured layer at 30 to 35 feet.

The soil boring results for Race Track Hill demonstrate the variability of EC, boron, and chloride in sediments between ground surface and groundwater. Figure 5 characterizes the variability of constituent concentrations in the soil by plotting the mean of all measured values shown as a vertical black line. The shaded areas on either side of the mean are one standard deviation in width. This figure shows that there are few values outside of the range shown. EC profiles show the most variability and boron has the lowest variability. The boron concentration increase near the soil surface of the irrigated area (RTH-1) reflects the adsorptive forces that bind boron to soil. No increases in chloride or EC in the shallow soil are observed in the dataset. At all depths below 40 feet, the natural variability of EC, boron, and chloride profiles among the borings indicates that produced water has not influenced constituent levels in the subsurface.

Shallow Monitoring Wells. Shallow monitoring wells (RTH-1, 3 and 4) were installed and sampled at three of the boring locations completed in Phase 1 (Figure 3). In December 2014, two additional shallow monitoring wells were installed as part of the Phase 2 investigations: RTH-5 was installed northeast of the Race Track Hill Facility near Cottonwood Creek and shallow monitoring well RTH-6 was installed on the southwest side of the southernmost surface impoundment at Race Track Hill (Figure 3). Table 1 provides information on shallow well completions at Race Track Hill (see also Appendix A and Appendix B).

Groundwater levels were measured in April and December 2014 at RTH-1, 3 and 4 and in December 2014 at RTH-5 and 6 (Table 2). Depth to groundwater at the Race Track Hill Facility occurs at depths ranging from 33 to 120 feet bgs. Shallow groundwater mounding was observed beneath the Race Track Hill Facility as indicated in Figure 6 for the December 2014 monitoring event, but not in the deep groundwater

The results of April 2014 and December 2014 groundwater sampling are shown in Table 3. Shallow groundwater beneath the Race Track Hill Facility has been influenced by the produced water that has percolated through the ponds and irrigation areas since 1958 at three locations: RTH-1, RTH-4, and RTH-6. The concentrations of boron and chloride in these limited locations can be explained by percolation of produced water at the Race Track Hill Facility. RTH-3 is at the base of Race Track Hill and, based on the high sulfate concentration, has likely been affected by more than one water source. Water chemistry at RTH-5 is much different than that of the other wells, and does not indicate any effect from the produced water percolation at Race Track Hill.

Total petroleum hydrocarbon-diesel (TPHd) concentrations ranged from less than non-detect to 240 µg/l, well below environmental screening level for groundwater of 500 µg/l for TPHd (San Francisco Bay Regional Water Quality Control Board, 2013). The only detectable TPHd concentration was in RTH-4.

EC and boron are highest at well RTH-1 and slightly lower at RTH-4 and RTH-6. These constituent levels are lowest at wells RTH-3 and RTH-5. RTH-5 is much lower in EC and B than all other wells, likely because it is furthest from Race Track Hill and has not been influenced by water from the Race Track Hill ponds. Wells RTH-3 and RTH-5 also have the lowest concentrations of TDS, calcium, chloride, and sodium.

2.2 Deep Groundwater Investigations

The Phase 1 investigations for the deep groundwater in the Race Track Hill and Fee 34 Facility areas consisted of the review of geologic and hydrogeologic information, and construction of a geologic cross section. This information was reported in the Phase 2 Work Plan for deep well installation submitted to the CVRWQCB in October 2014 (KDSA, 2014).

The Phase 2 subsurface investigations for the deep groundwater at the two Valley Water facilities consisted of installation, logging, sampling, and analysis of four monitoring wells (KDSA, 2015, Appendix C). The wells were installed and developed during January and February, 2015, and the initial monitoring was completed in March 2015.

Three deep monitoring wells (RTH-7D, 8D and 9D) were installed, developed, and sampled at the Race Track Hill Facility. Each well is located near produced water ponds and adjacent to a shallow monitoring well (Figure 3). One deep monitoring well (Well C-1D) was installed at the Fee 34 Facility and is located southwest of the large shipping pond (Figure 2). The well installed at the Fee 34 Facility taps the shallowest groundwater beneath the site.

Well Installation. Bradley & Sons of Del Rey, CA installed the deep monitoring wells by the direct rotary method during January 26 - February 24, 2015. An electric log and sonic log were run in the hole for each new monitoring well. A geologic log and well completion diagram for each monitoring well was also prepared (KDSA, 2015; Appendix C).

At the Race Track Hill Facility, saturated deposits at the time of drilling were indicated below depths ranging from about 70 to 155 feet. At the Fee 34 Facility, saturated deposits were indicated below a depth of 270 feet. Deposits opposite the perforated intervals of the new wells were primarily alternating layers of sand, gravel, and sandy clay. A five-inch diameter Schedule 40 PVC casing was installed in a twelve-inch diameter hole for each deep well at the Race

Track Hill Facility. At the Fee 34 Facility, a five-inch diameter Schedule 80 PVC casing was installed in a twelve-inch diameter hole. Flush joints and threaded ends were used and all joints for the casing were made using clean couplings. No glue or solvents were used in connecting the casing joints. Machine-cut 0.03-inch slot factory perforated was used for the perforated sections. Table 4 shows construction information for the deep monitoring wells.

Subsurface Geologic Conditions. A subsurface geologic cross section was previously developed that extended through the western and northern parts of the facility (KDSA, 2014). The shallowest deposits beneath the facility are part of the Kern River-Chanac Formation and are generally unconsolidated. These alluvial deposits dip to the southwest beneath the facility. These deposits pinch out east of the facility and are indicated to be about 700 feet thick near the west edge of the facility. The next deep deposits beneath the facility are the marine Santa Margarita Formation. These deposits are indicated to extend to a depth of about 800 feet near the northeast corner of the facility and to a depth of about 1,500 feet near the west edge of the facility. Beneath the Santa Margarita Formation is the Edison Shale, which is of low permeability and forms the base of the aquifer in the Race Track Hill area. Comparison of the logs for the deep monitoring wells with the cross section indicates that RTH-8D likely encountered the top of the Santa Margarita Formation at a depth of about 140 feet. The other two deep monitoring wells at the Race Track Hill Facility only encountered deposits of the Kern River-Chanac Formation.

At the Fee 34 Facility, the top of the Santa Margarita Formation is more than 1,200 feet deep. Water supply wells in this area and deep monitoring well C-1D tap deposits of the overlying Kern River-Chanac Formation (KDSA, 2014).

Groundwater Levels. Table 5 provides water-level data for the deep monitoring wells on March 17, 2015. The water-level elevation in C-1D at the Fee 34 Facility was 337.1 feet above mean sea level (AMSL).

Depth to water in the deep monitoring wells at Race Track Hill Facility ranged from 86.9 feet below the measuring point at RTH-8D to 225.3 feet at RTH-9D. Depth to water in C-1D at the Fee 34 Facility was 298.4 feet below the measuring point. Considering the depths where saturated deposits were indicated during drilling, the water levels in the completed wells indicate that the groundwater tapped by the wells is under a confining pressure. Dee Jaspar and Associates, Inc. of Bakersfield surveyed the elevations of the measuring points for the new wells. Water-level elevations for the monitoring wells at the Race Track Hill Facility ranged from 854.3 feet above mean sea level at RTH-7D to 787.8 feet at RTH-8D. Figure 7 shows water-level elevations and the direction of groundwater flow for the deep monitoring wells at the Race Track Hill Facility on March 17, 2015. A north-northwest direction of groundwater flow was indicated. This suggests that pumping of wells north-northwest of the facility has influenced the direction of groundwater flow. The water-level slope averaged about 130 feet per mile beneath the facility. To our knowledge, this is the first time that groundwater gradients in this area have been mapped.

Groundwater Quality. The four deep monitoring wells were sampled between March 11 and March 17, 2015. Three well volumes were removed by pumping from each well prior to the collection of water samples for laboratory analyses. The samples were preserved and shipped to FGL Environmental in Santa Paula for determination of inorganic chemical constituents and total organic carbon (TOC), to APPL, Inc. in Clovis for total petroleum hydrocarbons-diesel (TPH-d), and to the University of Arizona Environmental Isotope Laboratory, Tucson, Arizona for the analysis of stable isotopes of water.

Table 3 summarizes the results of the laboratory analyses of water from the deep monitor wells, shallow monitoring wells, and nearby off-site wells. Total dissolved solids (TDS) concentrations in the water samples from the deep monitoring wells at Race Track Hill ranged from 2,960 to 4,180 mg/l. The lowest TDS concentration was at RTH-9D (2,960 mg/l), and the highest concentrations (3,900 to 4,180 mg/l) were in water from RTH-7D and RTH-8D. Chloride concentrations in water from these wells ranged from 820 to 2,060 mg/l. The chloride concentration was highest in water from RTH-8D and was lowest in water from RTH-9D. Boron concentrations in water from these wells ranged from 0.2 to 9.1 mg/l. The lowest boron concentrations (0.2 to 0.5 mg/l) were in water from wells RTH-7D and RTH-9D, and the highest concentration was in water from RTH-8D. Sulfate concentrations in water from these wells ranged from 23 to 910 mg/l. The lowest sulfate concentration was for RTH-8D and the highest concentrations (860 to 910 mg/l) were in water from RTH-7D and RTH-9D. Sulfate type groundwater was previously found at RTH-3, a shallow monitor well south of RTH-8D. TPHd concentrations ranged from less than 50 µg/l to 280 µg/l, well below environmental screening level for groundwater of 500 µg/l for TPHd (San Francisco Bay Regional Water Quality Control Board, 2013). The only detectable TPHd concentration was in RTH-8D.

2.3 Results of Nearby Off-Site Well Sampling

Four off-site wells were sampled to assess whether local area wells showed impacts related to produced water from Race Track Hill. Well locations are shown Figure 8. Figure 8 and the table below show the status of the wells identified in well records received from DWR. Wells 26B and 16H are downgradient of Race Track Hill. Wells 13A and 13B are located along Cottonwood Creek east of Race Track Hill. Well 24J is upgradient and likely represents background groundwater in the area of Cottonwood Creek. Well 12F is located along Cottonwood Creek, downstream from Breckenridge Road and just south of Highway 178.

Well Number	Depth, feet	Status/Comments
13A	80	Unused Industrial Well (Gravel Plant)
13B	60	Unused Industrial Well (Gravel Plant)
16H	741	Active Irrigation Well **- Sampled**
24J	360	Active Domestic Well **- Sampled**
24M	460	Unused Domestic Well, Corroded Casing, Well Cannot Be Sampled
26B	800	Active Domestic Well **- Sampled**
26C	455	Domestic Well –Not Found in the Field, May Have Been Destroyed – 1.05 miles West Southwest of Race Track Hill
26N	680	Unused Domestic Well – 1.6 miles Southwest of Race Track Hill
12F	70	Unused Shallow Well **- Sampled**

Water quality data for the wells sampled are shown in Table 3. EC and concentrations of TDS, boron, chloride, sodium, and calcium, are all low. These sample results indicate no influence on water quality caused by produced water from the Race Track Hill Facility. Well 12F is located in the floodplain of Cottonwood Creek, and potentially downgradient of Race Track Hill, in terms of shallow groundwater. Results of this well sample provide evidence that groundwater beneath Cottonwood Creek has not been mixed with produced water. There are no other active supply wells indicated that are exactly downgradient of the Race Track Hill Facility, in terms of the deep groundwater. No imminent threat to groundwater supplies or to the Kern River was identified at this location.

2.4 Analysis of Historical Flows to the Fee 34 and Race Track Hill Facilities

The record of annual flows to Race Track Hill was compiled from Valley Water's records. In addition, the chronology of development of evaporation/percolation ponds and irrigated areas was also determined. This information was used to determine the total flow volume to Race Track Hill and the amount of water loss due to evaporation from the ponds and evapotranspiration from the irrigation areas. These two analyses allow calculation of the volume of produced water percolated to the subsurface and land applied at the Race Track Hill Facility.

2.4.1 Produced Water Quality for Valley Water Facilities

Table 6 shows available historical water quality data for produced water sent to Race Track Hill from 1960 through 2015. During this time period, EC ranged from 4,630 µmhos/cm to 7,400 µmhos/cm with a median value of 6,190 µmhos/cm. Median chloride concentration is 1,988 mg/l and the median boron concentration is 14 mg/l. The produced water concentrations have generally been lower in samples collected after 2000.

2.4.2 Flows from Valley Water Facilities from 1960 - 2014

Valley Water's records of produced water flows to Race Track Hill start in 1960 and continue to present. Annual produced water volume records for 1960 through 2014 are shown in Table 7. (As requested in the draft Cease and Desist Order (CDO) monthly flows for the period 1 January 2010 through 31 December 2014 are included in Appendix E). The total volume from 1960 to 2014 was approximately 198,730,000 barrels (8,350 MG; 25,600 Ac-ft). Average annual volume based on this dataset is approximately 3,613,000 barrels per year (152 MGY; 466 Ac-ft/yr).

In 1960, the Race Track Hill Facility consisted of 17 evaporation/percolation ponds and approximately 30 acres of sprinkler irrigation area. The pond surface area at that time was 14.8 acres. The margins of all ponds below the initial ponds were planted with cuttings of Salt Cedar (Tamarisk) in 1960 to enhance water loss by evapotranspiration and salt uptake. At the same time, the irrigation areas were seeded with salt tolerant grasses.

Records for 1976 show that the evaporation/percolation pond system was expanded to 27 ponds with approximately 19.8 acres of evaporative surface area and the irrigation area covered 66 acres. Records indicate that the Salt Cedar canopy had grown to an average height of 40 feet by 1976. In 1978, an additional 25 acres of irrigated area were added to reach the current 91 acres. The 91 acre area is divided into four main irrigation zones with a number of irrigation laterals to allow control of the distribution of irrigation. Much of the irrigation occurs in an area along the southeast portion of Race Track Hill along Breckenridge Road (Figure 3), but irrigated areas also cover slopes adjacent to the evaporation/percolation ponds along the central and northern swales at the site.

2.4.3 Precipitation and Evapotranspiration at Race Track Hill

Precipitation information for the Race Track Hill Facility was obtained from the WRCC Bakersfield WSO (Station 040442) using records from 1938 to 2014 (WRCC, 2015). Evaporation and evapotranspiration information was taken from the CIMIS weather station at Arvin-Edison Station 125 (CIMIS, 2015). Average monthly values for precipitation and potential evaporation are shown in Table 8, with precipitation just 10% of total evapotranspiration levels (6.1 inches of precipitation versus 61.1 inches of evapotranspiration).

Calculations of pond evaporation and evapotranspiration from vegetation were made using average annual values for the period of 1960 to 2014. Crop coefficients for both bare soil and sparse crops with a winter-spring growing season were used. Figure 9 shows the produced water discharge and evaporative losses from the ponds and irrigated areas.

During the initial years, flows to Race Track Hill were the highest recorded and evaporative losses were low because the irrigated area was much smaller and the Salt Cedar canopy had not yet grown to maturity. Thus, more produced water was percolating. Flows to the facility decreased over the years according to oil production trends and availability of other disposal alternatives, but the flows stabilized in the early 1990s. The evaporative loss for the ponds and irrigation areas also stabilized in approximately 1980 when the irrigation area expanded to 91 acres and crops were well established. Figure 9 shows that there has been a good balance between flows to the facility and evaporative losses since the early 1990s. During most years, evaporative losses almost equal the produced water flow.

The 54 year record of flows and evaporative loss information was used to estimate the amount of produced water that percolated to the subsurface at Race Track Hill. To account for varying crop conditions in the irrigated area, bare soil and sparse grass canopy conditions were both considered. These calculations are summarized in the table below:

	Bare Soil	Sparse Canopy
Total Water Volume Pumped to Race Track Hill[(a)], MG:	8,350	8,350
Pond and Irrigation Evapotranspiration[(b)],% of Produced Water Volume:	**45%**	**49%**
Total Evaporative Water Loss, MG:	3,760	4,120
Net Produced Water Percolation at Race Track Hill, MG:	**4,600**	**4,200**
Ac-ft:	**14,100**	**12,900**
Porosity:	30%	30%
Volume of Deposits Required to Store Water, Ac-ft:	47,000	43,000

Notes:
(a) Source: Valley Water Records 1960-2014.
(b) Based on water balance calculations.

These estimates indicate that between approximately 12,900 and 14,100 Ac-ft of produced water may have percolated to the subsurface at Race Track Hill over 54 years. The total sediment volume required to store this water in the pore space is also estimated based on an assumed porosity for the soils and sediments beneath the site, 0.3. As an example of the potential area this storage volume could occupy, the area beneath Race Track Hill that could store groundwater is estimated to be between 150 and 200 acres. The approximate thickness of sediments required to store the produced water volumes calculated above would range from 190 feet beneath the 200 acre area to 290 feet beneath the 150 acre area.

Section 3: Analysis and Summary of Investigation Results

In this section, the water level and water quality data for Phase 1 and 2 subsurface investigations are combined so that overall evaluations can be made of the following:

- Evaluation of groundwater quality for shallow monitoring wells, deep monitoring wells, and off-site wells
- Groundwater flow direction and mounding at Race Track Hill
- The volume of water in the subsurface at Race Track Hill
- Potential influences on groundwater

3.1 Water Quality and Isotopic Evidence of Potential Impacts

Figure 10 shows summary results of recent groundwater monitoring for wells at the Fee 34 Facility, Race Track Hill Facility, and off-site wells in the vicinity of Race Track Hill. Individual graphs for boron, chloride, sulfate and EC show the general trends of the dataset for 13 wells. The data are also presented in Table 3.

Samples collected from off-site wells (26B, 16H, 24J, and 12F) all have low levels of EC, boron, and chloride. Samples from well C-1D (at the Fee 34 Facility within the Edison Oil Field Producing area) and RTH-5 (in the Cottonwood Creek floodplain east of Race Track Hill) also have low levels of these constituents. None of these wells appear to have been affected by produced water.

The water sample for monitoring well RTH-3 also has low concentrations of boron and chloride, but the sulfate concentration and EC are higher than the unaffected wells. This groundwater quality appears to not be due to seepage of produced water, but may be related to irrigation practices.

Figure 11 is a trilinear diagram for water from the monitoring wells and off-site wells included in Table 3. In this diagram, concentrations are expressed as milliequivalents per liter, rather than milligrams per liter. The anion part of the diagram is used for much of the interpretation because the anion concentrations (chloride, sulfate, and bicarbonate) are less affected by exchange processes that are known to affect cations. Based on the distribution of water sample chemistry shown in Figure 11, several different water types can be observed on the anion trilinear plot in the lower left corner as well as the quadrilateral section of the figure. The following types of water were observed:

Type 1. Greater than 80 percent chloride equivalents are present in RTH-1, 4, 6, and 8D. The produced water also falls into this water type. The monitoring wells with this type of water are near evaporation/percolation ponds (see Figure 3). These well samples also have high boron concentrations (Table 3).

Type 2. Sulfate percentage of approximately 80 (RTH-3). RTH-3 taps shallow groundwater along the drainage on the east side of Race Track Hill. The RTH-3 water chemistry is unique in comparison to all other shallow wells because it has low bicarbonate and low chloride percentages. In addition, this sample has lower boron, EC, TDS, and sodium than the wells in Type 1 above. The high sulfate and low chloride concentrations of the RTH-3 sample make this water chemistry different from the wells with high chloride concentrations (Type 1).

Type 3. Chloride percentages ranging from about 50 to 60 with low bicarbonate and significant sulfate (RTH-7D and 9D). These deep groundwater monitoring wells are located along the western part of the facility. Water from these wells appears to be a mixture of the Type 2 high sulfate percentage groundwater and Type 1 high chloride percentage groundwater or produced water. These wells also have lower boron concentrations than the wells in Type 1 above.

Type 4. Wells with bicarbonate greater than 30 percent. This group consists of C-1D, RTH-5, and the four off-site wells. These wells all have low TDS and boron concentrations, but fall into separate sub-categories:

- Chloride percentage less than 20 and sulfate percentage less than 40 (RTH-5, 24J, 12F). These three wells tap the shallow groundwater along Cottonwood Creek and none of these samples has been influenced by produced water. Off-site well 24J is located upstream of Breckenridge Road along Cottonwood Creek and off-site well 12F is downstream of Breckenridge Road. These wells have a composition that is natural in origin.
- The sample for well 26B appears to be a mixture of high sulfate groundwater and the high bicarbonate groundwater described just above.
- Samples for monitoring well C-1D and well 16H are similar in having less than 20 percent sulfate and 40 to 50 percent chloride. These samples differ from the Cottonwood Creek well samples due to higher chloride percentage, and differ from the Race Track Hill wells due to higher bicarbonate and lower TDS.

Figure 12 shows a comparison of the stable isotope ratios of hydrogen and oxygen for the monitoring wells installed in the Phase 1 and Phase 2 investigations. Stable isotopes of water samples indicate that the isotopically heaviest water (which plots to the right along the x axis) was found in samples collected from RTH-7D and RTH-8D. The isotopically lightest water samples on the left side of the figure came from C-1D and RTH-5, wells, which are clearly not affected by produced water. The remaining wells, all on Race Track Hill, have lower oxygen isotope values. The three pairs of shallow and deep wells each have heavier water in the shallow well. This effect could be related to effects of pond evaporation and evapotranspiration in the irrigated areas, which act to concentrate the percolating water.

3.2 Fee 34 Facility

The Phase 1 and Phase 2 subsurface investigations included collection of soil boring samples in the unsaturated zone; installation, logging, and sampling of a groundwater monitoring well; and leak testing of two of the lined ponds used for treatment of produced water.

Soil Boring Investigations. The results of soil boring investigations are summarized below:

- As part of Phase 1 investigations, a soil boring was advanced to 200 feet bgs at a location 10 feet from the unlined skimmed oil ponds and within 30 feet of the produced water treatment ponds (Figure 2). Samples were collected and analyzed for water content, EC, boron, chloride, and TPHc. The boring log documented varying layers of well graded sand and silty sand. No perched water was encountered during advancement of the boring and none of the measured results for water content gave any indication of accumulations of percolating water or groundwater.
- TPHc concentrations were not detected at any depth below 5 feet bgs. The TPHc concentration at 5 feet was 220 mg/kg, well below the shallow soil environmental screening level of 500 mg/kg (San Francisco Bay Regional Water Quality Control Board, 2013).
- No elevated EC levels or elevated concentrations of boron or chloride were observed in the soil boring samples (Figure 4).
- The findings summarized above are consistent with and confirm the results of soil borings taken beneath the Fee 34 Facility in 1996 (Kennedy/Jenks, 1996). Three 80-foot slant borings were advanced beneath the ponds; the depth below ground surface reached 70 feet. Samples were collected and analyzed for boron, chloride, EC and TPHc. The results did not identify movement of produced water or evidence of constituents in the unsaturated zone.

Monitor Well Installation and Sampling. A groundwater monitoring well was installed and sampled in early 2015. The drilled depth was 460 feet bgs and the perforated interval was 395 to 435 feet bgs (Table 4). At the time of sampling, the water level was 298.4 feet bgs (Table 5) indicating that the groundwater tapped by the well is confined. Water chemistry of the sample collected on 11 March 2015 is reported in Table 3 and discussed in Section 3.1 above. The low levels of boron, chloride, and EC indicate no effects of percolation of produced water from the Fee 34 Facility.

Leak Testing of Two Fee 34 Produced Water Treatment Ponds. An initial round of leak testing of the gunite-lined ponds was conducted in Spring 2014 (see Section 2.1.1). The results indicated that the likely range of pond seepage for the South Pond was 0.3 to 3.3 mm/day. The likely range in seepage for the North Pond was 3.3 to 5.5 mm/day. The test results incorporated significant measurement uncertainty because: a) the tests were conducted during a period of high evaporation when measurement errors are proportionately larger for the four sensors used in the measurement; b) there was a rainfall event during one of the tests that introduced another uncertainty associated with the measurement of precipitation; and c) the sensors used to measure pond water level are operating at the limits of their resolution. It should also be noted that the results of unsaturated zone testing and sampling of monitoring well C-1D indicate that seepage has not been significant.

Summary. No evidence of produced water impacts to the unsaturated zone or groundwater were documented in Phase 1 and Phase 2 results. An important finding was the water quality analysis of groundwater from monitoring well C-1D that taps first encountered groundwater beneath the Fee 34 Facility. Water quality of the sample collected from this well indicates that groundwater beneath the Facility does not have elevated concentrations that would indicate the presence of produced water. Thus, operation of the Fee 34 Facility does not represent an imminent threat to local groundwater.

3.3 Race Track Hill

Phase 1 and Phase 2 investigations for the Race Track Hill Facility have been completed. The resulting dataset provides valuable information to characterize groundwater flow and water quality at this site. In addition, several other evaluations have been performed: water quality sampling for off-site wells in the vicinity of Race Track Hill, preparation of a water balance for the produced water flows at this site, and an evaluation of the potential for runoff from the ponds and irrigated areas offsite to Cottonwood Creek, the nearest surface water.

3.3.1 Groundwater Conditions

Groundwater Flow. Figure 7 shows the groundwater flow direction for the deep groundwater. The deep groundwater flow direction in March 2015 was approximately north-northwest at a gradient of 130 feet/mile. Based on the three water level measurements shown on Figure 7, mounding does not occur in the deep aquifer beneath Race Track Hill. Well RTH-7D, the southernmost deep well, had the highest water level elevation and water levels for wells RTH-8D and RTH-9D were at least 50 feet lower in elevation.

Figure 6 shows the groundwater flow direction for the shallow groundwater. The flow direction of shallow groundwater in late December 2014 was to the northeast at approximately 50 feet/mile. This flow path and gradient were calculated using the three wells to the east of Race Track Hill. The ground surface for the two wells on Race Track Hill, RTH-1 and RTH-6, are approximately 150 feet higher in elevation than wells RTH-3 and RTH-4 and water levels at RTH-1 and RTH-6 are over 100 feet higher than those at RTH-3 and RTH-4. RTH-1 and RTH-6 are also directly adjacent to active evaporation/percolation ponds. The water levels indicate that a groundwater mound is present in the shallow groundwater but there is not currently enough data to fully characterize the extent.

Water Quality. A detailed discussion of groundwater quality is provided in Section 3.1 above. Results indicate that the wells along Cottonwood Creek (24J, RTH-5, 12F) do not show impacts or any imminent threat from produced water. Some effect of produced water on groundwater quality has occurred on-site at wells RTH-1, RTH-4, RTH-6, and RTH-8D. These wells are all near evaporation/percolation ponds. The effects on these shallow monitoring wells appear to be associated with the percolation ponds and not due to effects of irrigation practices. Well RTH-3 is the closest well to the irrigation area in the southeast part of Race Track Hill and water quality at this location is different from that of wells RTH-1, RTH-4, RTH-6, and RTH-8D. Wells RTH-7D and RTH-9D are apparently a blend of high chloride produced water and high sulfate groundwater. These waters are indicated to be a mixture of produced water and native groundwater. Boron concentrations are low in each of these wells. The sulfate concentrations in these wells are higher than the levels found in the Cottonwood Creek wells.

3.3.2 Water Balance for Discharges at Race Track Hill

A water balance of produced water flows and site evaporative losses was presented in Section 2.4. Figure 9 shows the 1960 to 2014 annual produced water flows to Race Track Hill and the amount of water lost to pond evaporation and evapotranspiration from the irrigated areas. Of the total 8,350 MG volume of produced water from 1960 through 2014, between 45 and 49 percent was lost to evaporative processes. Evapotranspiration from the irrigated areas comprises 58 to 62 percent of the total water losses.

The difference between produced water flows and evaporative losses is 4,200 to 4,600 MG (12,900 to 14,100 Ac-ft). This volume is assumed to have entered the subsurface at Race Track Hill over a 54 year time period. Using an estimated average porosity of the sediments at the site, the volume of sediments required to hold this water is between 43,000 and 47,000 Ac-ft. This volume can be visualized as an area of 150 acres and thickness of 290 feet or an area of 200 acres with a thickness of 190 feet.

Flows at Race Track Hill between 1960 and 1968. The water balance for Race Track Hill shows that the annual flows to Race Track Hill were largest during the 1960s (Table 7, Figure 9). During the period from 1960 through 1968 before California's Antidegradation Policy was adopted (SWRCB, 1968), the total produced water flow is estimated to be 6,175 Ac-ft and water losses by evaporation and evapotranspiration totaled 1,175 Ac-ft. The evaporative losses were lower during this time period because, in 1960, the irrigation area was only 30 acres and the Salt Cedar and grasses had not yet reached maturity. The difference between produced water flow and evaporative loss, 5,000 Ac-ft, was applied to the initial, smaller pond surface area and irrigated acreage. As a result, the hydraulic loading was higher than in later years. During this period, produced water would have moved through the unsaturated zone towards the shallow groundwater beneath Race Track Hill. The seepage for large flows applied to smaller land areas was likely greater than the seepage in later years when the produced water flows were lower and were only slightly greater than pond evaporation and evapotranspiration from the irrigation areas. Between 1960 and 1968, four produced water samples were collected and analyzed for water quality constituents (Table 6). The average salinity values from these samples were 6,950 µmhos/cm EC, 2,220 mg/l Chloride, and 12 mg/l Boron. Although there are no groundwater samples available for this time period, it can be presumed from later sampling that the shallow groundwater would reflect similar values.

Potential for Runoff from the Race Track Hill Facility. Management of the ponds and irrigated areas at Race Track Hill has been developed to maximize evaporative losses, maintain pond freeboard, and minimize runoff and erosion in the irrigated areas. As part of a review of Facility management practices and in order to rebut allegations in the CDO that the Facility presents an imminent threat to Cottonwood Creek and the downstream Kern River, an evaluation of the potential for runoff and erosion was initiated during Spring 2015:

- Aerial photographs taken between September 1992 and March 2015 were reviewed to identify any signs of surface water flow in the roadside drainage along Breckenridge Road. Figure 13 shows fourteen aerial photographs of Race Track Hill and Breckenridge Road to the east. Figure 14 shows fourteen aerial photographs of the location where Breckenridge Road reaches Cottonwood Creek just east of Race Track Hill (see Figure 8). Each aerial photograph was evaluated using higher resolution images than those in the Figures. This evaluation helped to distinguish shadows from changes in vegetation.
    - Figure 13 shows the vegetation growth at Race Track Hill and no signs of vegetation growth caused by water in the draw between Breckenridge Road on the east and the adjacent irrigated area on Race Track Hill (Breckenridge Road is elevated above the swale in this area). There are ditches along the base of the irrigated area that collect infrequent flows, primarily from rainfall events, and route any flow to collection sumps. Water in these sumps is pumped back to the upper ponds to maintain adequate freeboard in the collection sumps. The Race Track Hill photographs do not show signs of

ongoing erosion in the irrigated areas and the irrigated areas do not appear to have changed substantially since 2002.

- o The photographs of Cottonwood Creek (Figure 14) show that there is riparian vegetation along the creek bed. In contrast, there is very little vegetation along the swale adjacent to Breckenridge Road and downgradient from Race Track Hill (the dark areas shown in the figure were confirmed to be shadows when higher resolution images were evaluated). Flows along Cottonwood Creek have been documented, but flows from the west (near Race Track Hill) have not been recorded and are not evident in the photographs.

  The largest 30-day precipitation (5.98 inches) and largest 7-day precipitation (4.58 inches) recorded at the Bakersfield WSO station occurred in December 2010 (see Section 1.1.3). In the April 2011 photograph, vegetation is lush along Cottonwood Creek, but there is no observable difference in vegetation in the drainage along Breckenridge Road.

- Valley Water has initiated a survey of Race Track Hill to assess the adequacy of on-site storage for produced water and the occasional precipitation events (Appendix F; C. Zimmerman, personal communication, 2015). The field survey crew has observed the existing water management features including evaporation/percolation ponds, drainage ditches, catchment basins, swales, and detention basins that can provide temporary retention of precipitation. They report no evidence of erosion or sediment rills that would indicate either sheet flow or channelized run-off of on-site water.

- Dee Jaspar and Associates made a preliminary evaluation of runoff conditions at Race Track Hill. The preliminary report is included as Appendix F. The evaluation makes use of methods outlined in the Kern County Hydrology Manual, tools available on the County website, and a 100 year return period 24-hour precipitation of 3.00 inches along with other maximum precipitation conditions discussed above. A number of the drainage basins on Race Track Hill have pond capacity to maintain runoff from the design storm. Basins with less pond storage capacity are served by a network of drainage ditches, and catchment basins that are used to retain water to be pumped up slope to other ponds on Race Track Hill. Facility operators state that, during large storm events, a booster pump and movable above-ground pipelines are used to intercept water flowing on the west side of Breckenridge Road and pump the water upslope to ponds with available capacity. The runoff infrastructure and operational management practices, including adjusting freeboard levels prior to the wet season or storm events, appear to be adequate to prevent run-off from the Race Track Hill Facility even during the largest precipitation events discussed above.

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Tables

Table 1: Shallow Monitoring Well Construction Data

Well ID	Completion Date	Well Diameter (inches)	Top of Casing Elevation (ft AMSL)[(a)]	Drilled Depth (ft bgs)[(b)]	Well Screen Top (ft bgs)	Well Screen Bottom (ft bgs)	Sand Pack Top (ft bgs)	Sand Pack Bottom (ft bgs)	Bentonite Seal Top (ft bgs)	Bentonite Seal Bottom (ft bgs)	Grout Seal Top (ft bgs)	Grout Seal Bottom (ft bgs)
Shallow Monitoring Wells												
RTH-1	04/11/2014	4	1,025.85	70.5	50	70	48	70.5	45	48	1.5	45.0
RTH-3	04/22/2014	4	879.39	105.1	84.6	104.6	82	105.1	76.2	82	1	76.2
RTH-4	04/17/2014	4	871.02	150	80	100	78	104	72	78	5	72
RTH-5	12/11/2014	4	810.80	57.4	27	57	24.5	57.4	22.5	24.5	3	22.5
RTH-6	12/10/2014	4	1,059.82	145.0	113.5	143.5	111	145.0	107.8	111.0	1	107.8

Notes:

(a) "ft AMSL" denotes feet above mean sea level, NAVD88. RTH-1 through RTH-4 surveyed in June 2014 and RTH-5 and RTH-6 surveyed in December 2014 by Dee Jaspar and Associates.

(b) "ft bgs" denotes feet below ground surface.

Table 2: Shallow Groundwater Level Data

Monitoring Well	Measuring Point[(a)] Elevation (ft AMSL)[(b)]	Date	Depth to Groundwater (ft TOC)[(c)]	Groundwater Elevation (ft AMSL)
RTH-1	1025.85	4/30/2014	47.91	977.94
RTH-1	1025.85	12/22/2014	48.15	977.70
RTH-3	879.39	4/29/2014	80.83	798.56
RTH-3	879.39	12/22/2014	87.31	792.08
RTH-4	871.02	4/29/2014	78.45	792.57
RTH-4	871.02	12/22/2014	84.41	786.61
RTH-5	810.80	12/21/2014	33.45	777.35
RTH-6	1059.82	12/22/2014	120.31	939.51

Notes:

(a) Top of PVC Well Casing

(b) ft AMSL = feet above mean sea level, to NAVD88 datum. RTH-1 through RTH-4 surveyed in June 2014 and RTH-5 and RTH-6 were surveyed in December 2014 by Dee Jaspar & Associates.

(c) ft TOC = feet below top of casing

Table 3: Groundwater Quality Data for Monitoring Wells and Off-Site Wells

Monitoring Well	Sample Date	EC[(a)] µmhos/cm[(b)]	TDS[(c)] mg/L[(d)]	Chloride mg/L	Boron mg/l	Calcium mg/L	Magnesium mg/L	Sodium mg/L	Potassium mg/L	Sulfate mg/L	TPH[(e)] - Crude Oil µg/l[(f)]	TPH - Diesel µg/l
Race Track Hill Shallow Wells												
RTH-1	4/30/2014	8,690	6,600	2,900	16	560	44	1,100	8.9	42	1,300	<200
RTH-1	12/22/2014	8,650	7,000	2,900	16	550	45	1,300	9.0	42	<500[(g)]	-
RTH-3	4/29/2014	2,810	1,900	510	4.1	200	93	280	25	680	<500	<200
RTH-3	12/23/2014	1,920	1,500	130	0.65	170	81	180	22	800	<500	-
RTH-4	4/29/2014	5,900	4,400	1,700	6.9	450	170	580	22	510	<500	240
RTH-4	12/22/2014	6,540	5,100	2,000	5.4	490	180	680	23	370	<500	-
RTH-5	12/21/2014	624	450	26	0.066	64	23	51	6.4	92	<500	-
RTH-6	12/23/2014	4,680	3,500	1,300	3.0	400	48	570	22	290	<500	-
Deep Wells (Race Track Hill and Fee 34)												
RTH-7D	3/11/2015	5,420	3,900	1,250	0.5	535	104	411	35	910	-	<50
RTH-8D	3/11/2015	6,490	4,180	2,060	9.1	514	161	376	14	23	-	280
RTH-9D	3/11/2015	4,000	2,960	820	0.2	464	26	321	17	860	-	<50
C-1D	3/11/2015	1,400	800	229	0.2	101	18	130	4	110	-	<50
Offsite Wells												
16H	4/11/2015	570	390	75	0.2	25	1	99	2	18	-	<50
26B	4/20/2015	750	503	35	0.1	29	<1	114	4	191	-	100
24J	4/21/2015	667	526	20	< 0.10	71	24	35	5	95	-	<50
12F	6/9/2015	977	680	42	0.13	120	33	68	9.2	200	<500	-

Table 3: Groundwater Quality Data for Monitoring Wells and Off-Site Wells

Monitoring Well	Sample Date	pH pH Units	Arsenic µg/l	Bicarbonate $(HCO_3)^{(i)}$ mg/L	Carbonate $(CO_3)^{(j)}$ mg/L	Total Organic Carbon mg/L	Nitrate as N mg/L	Nitrate mg/L	Iron mg/L	Mn(k) mg/L	Zinc mg/L
Race Track Hill Shallow Wells											
RTH-1	4/30/2014	7.31	-	293	< 4.9	-	7.1	-	-	-	-
RTH-1	12/22/2014	7.26	-	268	< 4.9	-	14	-	-	-	-
RTH-3	4/29/2014	6.86	-	146	< 4.9	-	0.7	-	-	-	-
RTH-3	12/23/2014	6.91	-	122	< 4.9	-	0.16	-	-	-	-
RTH-4	4/29/2014	7.52	-	256	< 4.9	-	8.3	-	-	-	-
RTH-4	12/22/2014	7.38	-	256	< 4.9	-	3.4	-	-	-	-
RTH-5	12/21/2014	7.69	-	268	< 2.5	-	0.57	-	-	-	-
RTH-6	12/23/2014	7.34	-	232	< 4.9	-	23	-	-	-	-
Deep Wells (Race Track Hill and Fee 34)											
RTH-7D	3/11/2015	6.6	-	320	< 10	0.5	-	0.4	0.54	1.13	-
RTH-8D	3/11/2015	6.6	-	310	< 10	0.8	-	2.7	<0.05	0.11	-
RTH-9D	3/11/2015	7.0	-	210	< 10	0.5	-	1.0	<0.05	0.79	-
C-1D	3/11/2015	7.2	-	280	< 10	0.9	-	<0.5	<0.05	0.88	-
Offsite Wells											
16H	4/11/2015	7.5	4	170	< 10	0.8	<0.1	<0.5	0.19	0.29	0.09
26B	4/20/2015	7.7	-	130	< 10	<0.7	<0.1	<0.5	<0.030	0.02	<0.020
24J	4/21/2015	7.4	-	260	< 10	<0.7	3.5	15.6	<0.030	<0.010	<0.020
12F	6/9/2015	7.47	8.7	354	< 2.5	-	0.51	-	-	-	-

Table 3: Groundwater Quality Data for Monitoring Wells and Off-Site Wells

Notes:

(a) EC = Electrical Conductivity
(b) µmhos/cm = micromhos per centimeter
(c) TDS = Total Dissolved Solids
(d) mg/l = milligrams per liter
(e) TPH = Total Petroleum Hydrocarbons
(f) µg/l = micrograms per liter
(g) "<500"= not detected above the practical quantitation limit
(h) Ca, Mg, Na, K, As, B samples are "Total Recoverable"
(i) Bicarbonate data for the shallow well and Well 12F were converted from Bicarbonate as CaCO3 to Bicarbonate (HCO3).
(j) Carbonate data for the shallow well and Well 12F were converted from Carbonate as CaCO3 to Carbonate (CO3).
(k) Mn = Manganese

Table 4: Deep Monitoring Well Construction Data

Well ID	Date Completed	Drilled Depth (ft)[a]	Cased Depth (ft)	Perforated Interval (ft)	Gravel Pack (ft)	Annular Seal (ft)
RTH-7D	2/11/2015	360[b]	330	282-330	223-340	0-223
RTH-8D	1/28/2015	260	210	191-210	168-210	0-168
RTH-9D	2/17/2015	360	350	312-350	289-360	0-289
C-1D	2/24/2015	460	435	395-435	381-455	0-381

Notes:
Source: Kenneth D. Schmidt & Associates, Deep Well Report, June 2015.
Monitor Wells were constructed by Bradley & Sons of Del Rey and have 5-inch diameter PVC casings.
Schedule 40 was used for the first three wells, and Schedule 80 for C-1D.
(a) ft= feet
(b) Depth from surface

Table 5: Water Level Data For Deep Monitoring Wells - March 17, 2015

Well ID	Measuring Point Elevation (ft)	Depth to Water (ft)[a]	Water-Level Elevation (ft)
RTH-7D	1061.8	207.5[b]	854.3
RTH-8D	874.7	86.9	787.8
RTH-9D	1025.2	225.3	799.9
C-1D	635.5	298.4	337.1

Notes:
Source: Kenneth D. Schmidt & Associates, Deep Well Report, June 2015.
Water levels were measured by KDSA. Measuring point elevations were surveyed by Dee Jasper and Associates, Inc., of Bakersfield on March 20, 2015.
(a) ft = feet
(b) Measured from surface

Table 6: Produced Water Quality, 1961 - 2015

Sample Date	Electrical Conductivity µmhos/cm[(a)]	Chloride mg/l[(b)]	Boron mg/l	TDS[(c)] mg/l	Calcium mg/l	Mg[(d)] mg/l	Na[(e)] mg/l	K[(f)] mg/l	Sulfate mg/l	Nitrate(NO_3) mg/l	pH	TPH - Diesel[(g)] µg/l[(h)]	Lab Sheet Number (Appendix D)
1/20/1960	6,550	1,975	17.1	3,700	-	-	1200	-	-	-	-	-	1
1/3/1961[(i)]	4,906	1,631	2.0	2,826	476	73	465	20	96	-	7.7	-	2
1/18/1963	8,775	2,709	17	5,095	-	-	-	-	-	-	-	-	3
12/18/1964	7,577	2,553	11	4,399	-	-	-	-	-	-	-	-	4
10/23/1979	6,050	2,410	6	4,250	201	10	1,395	4.9	<5.0	58	7.6	-	5
9/28/1984	5,600	1,855	20	3,399	125	8.0	1,150	-	<5.0	<0.4	7.7	-	6
4/22/1992	7,100	2,010	-	3,750	188	9.0	1,290	17	<5.0	<0.4	7.6	-	7
5/28/1993	7,400	2,250	16	-	-	-	-	-	-	-	-	-	8
7/1/1993	6,190	1,830	14	3,570	160	8.4	1,180	14	5.3	<1.0	8.0	-	9
10/2/1995	6,870	2,000	13	3,900	170	13	1,300	16	<5.0	<1.0	8.2	-	10
7/13/1997	6,640	2,000	15	3,800	180	11	1,300	14	6	<1.0	7.9	-	11
7/18/2013	5,700	1,800	14	-	-	-	-	-	-	-	-	-	12
10/24/2014	5,700	1,500	13	3,000	100	10	1,300	12	18	-	7.49	-	13
1/6/2015	5,600	1,700	14	3,100	100	9.6	1,600	-	<0.50	<2.00	7.33	-	14
4/20/2015	4,630	1,370	12.6	2,830	88	11	923	17	3	<0.4	7.4	5,000	15A & 15B

Notes:

(a) µmhos/cm = micromhos per centimeter
(b) mg/l = milligrams per liter
(c) TDS = Total Dissolved Solids
(d) Mg = Magnesium
(e) Na = Sodium
(f) K = Potassium
(g) TPH-Diesel = Total Petroleum Hydrocarbons - Diesel
(h) µg/l = micrograms per liter
(i) Sample was filtered
(j) Highlighted cell means the value was calculated based on an average TDS/EC ratio of (0.58).

Table 7: Produced Water Discharge Flows: 1960 - 2014

Year[(a)]	Barrels Per Year	Milion Gallons Per Year	Average Barrels Per Day	Average Million Gallons Per Day
1958	0	0	0	0.00
1959	0	0	0	0.00
1960	6,995,600	294	19,166	0.80
1963	5,945,900	250	16,290	0.68
1964	4,836,600	203	13,251	0.56
1965	4,769,100	200	13,066	0.55
1966	4,751,900	200	13,019	0.55
1968	3,505,460	147	9,604	0.40
1969	3,078,800	129	8,435	0.35
1971	2,142,900	90	5,871	0.25
1972	2,805,800	118	7,687	0.32
1973	4,769,100	200	13,066	0.55
1981	4,825,652	203	13,221	0.56
1982	3,992,100	168	10,937	0.46
1983	4,180,100	176	11,452	0.48
1984	4,462,100	187	12,225	0.51
1985	3,801,000	160	10,414	0.44
1986	3,369,200	142	9,231	0.39
1987	2,921,000	123	8,003	0.34
1988	3,066,800	129	8,402	0.35
1989	2,126,500	89	5,826	0.24
1990	1,799,200	76	4,929	0.21
1991	1,585,000	67	4,342	0.18
1992	2,516,900	106	6,896	0.29
1993	2,818,900	118	7,723	0.32
1994	2,277,900	96	6,241	0.26
1995	2,336,330	98	6,401	0.27
1996	2,404,100	101	6,587	0.28
1997	3,409,000	143	9,340	0.39
2001	2,725,900	114	7,468	0.31
2007	2,630,000	110	7,205	0.30
2008	3,152,000	132	8,636	0.36
2009	2,618,000	110	7,173	0.30
2010	2,568,000	108	7,036	0.30
2011	2,568,000	108	7,036	0.30
2012	3,177,000	133	8,704	0.37
2013	3,839,000	161	10,518	0.44
2014	4,104,000	172	11,244	0.47

Note:

(a) Data not available for: 1961-1962, 1967, 1970, 1974-1980, 1998-2000, 2002-2006.

Table 8: Monthly Precipitation and Evapotranspiration for the Race Track Hill Area

Month	Average Precipitation[a] (Inches)	Evapotranspiration[b][c] (Inches)
January	1.0	1.5
February	1.1	2.3
March	1.1	4.1
April	0.7	5.6
May	0.2	7.7
June	0.1	8.7
July	0.0	9.1
August	0.0	8.5
September	0.1	6.1
October	0.3	4.1
November	0.6	2.1
December	0.9	1.4
Annual Total:	**6.1**	**61.1**

Notes:

(a) Western Regional Climate Center (WRCC) Station 040442 Bakersfield WSO (1938-2012).

(b) Reference evapotranspiration (ET0) from the CIMIS Station Arvin/Edison (#125) 1995 - 2015.

(c) Pond evaporation plus Salt Cedar water use is assumed to equal ET0.
Bare soil evapotranspiration uses a crop coefficient of 0.35.
Sparse canopy evapotranspiration uses a crop coefficient of 0.35 for May through November and 0.6 for the remaining months.

Figures

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Kennedy/Jenks Consultants

Valley Water Management Company
Bakersfield, California

Locations of the Valley Water Management Company Edison Oil Field Facilities

K/J 1365027*00
June 2015

Figure 1

Path: \\SFOISGDATA\Z_Drive\Projects\Valley Water Management Company\Events\Phase 2 Rpt\Final Rpt Figures\Figure 2_C Plant.mxd

Legend:

■ Approximate Soil Boring Location

Deep Monitoring Well Location (C-1D)

Notes:

1. Fee 34 Facility Located at SW1/4 Section 34 T29S R29E WDB&M

Kennedy/Jenks Consultants

Valley Water Management Company
Bakersfield, California

Fee 34 (C Plant) Produced Water Collection and Treatment Facility

K/J 1365027*00
June 2015

Figure 2

Document Path: \\sfoisgdata\Z_Drive\Projects\Valley Water Management Company\Events\Phase 2 Rpt\Final Rpt Figures\Figure 3_RTH Produced Water Disposal Facility.mxd

Legend:

RTH #7D — Deep Monitoring Well Location

RTH #1 — Shallow Monitoring Well Location

N

0 200 400

Feet

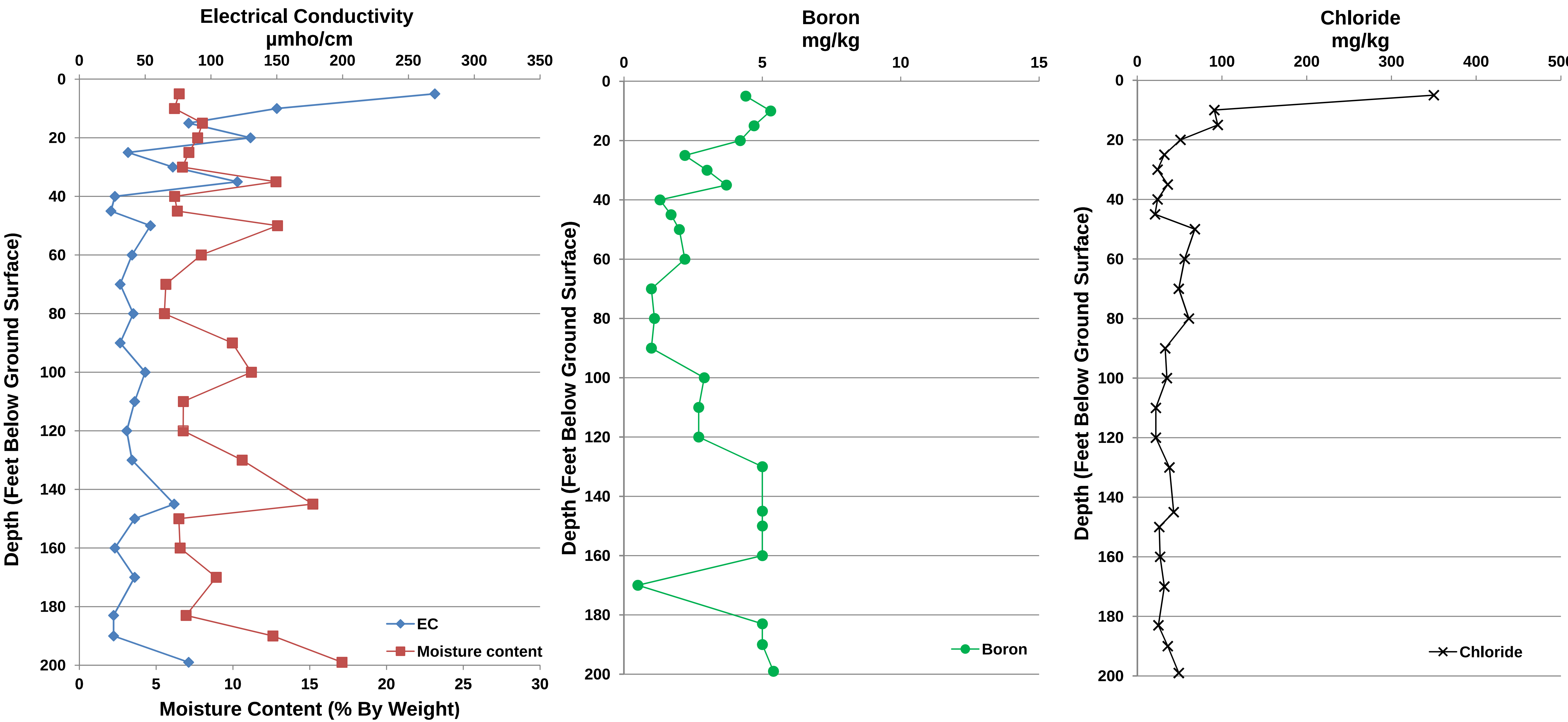
Kennedy/Jenks Consultants

Valley Water Management Company
Bakersfield, California

Race Track Hill Produced Water Discharge Facility

K/J 1365027*00
June 2015

Figure 3



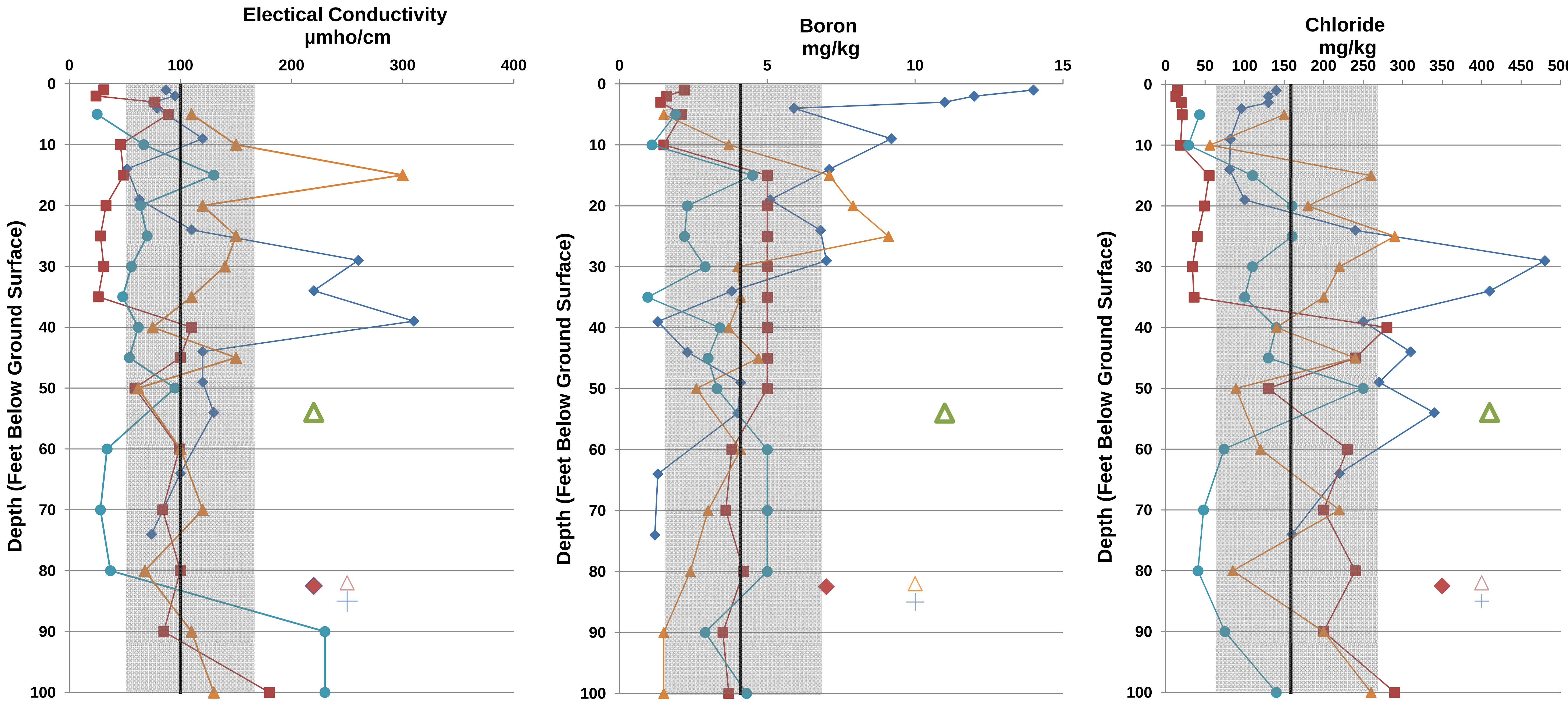
Notes:
1. EC = Electrical Conductivity
2. µmho/cm = micromhos per centimeter

Kennedy/Jenks Consultants
Valley Water Management Company
Bakersfield, California

Fee 34 Boring-1 EC, Soil Moisture, Boron and Chloride Depth Profiles

K/J 1365027.00
June 2015

Figure 4



Legend:

- RTH-1 Irrigated
- RTH-2 Unirrigated
- RTH-3
- RTH-4
- Average
- RTH-1 Approximate Depth to First-Encountered Groundwater
- RTH-2 Approximate Depth to First-Encountered Groundwater
- RTH-3 Approximate Depth to First-Encountered Groundwater
- RTH-4 Approximate Depth to First-Encountered Groundwater

Notes:

1. EC = Electrical Conductivity
2. µmho/cm = micromhos per centimeter
3. RTH-1 sample depths corrected to depth below original ground surface (1025.85 ft amsl)
4. Samples where Boron was reported as <5 mg/kg are plotted at 5 mg/kg

Kennedy/Jenks Consultants

Valley Water Management Company
Bakersfield, California

Race Track Hill Borings RTH-1 and RTH-2
EC, Boron and Chloride Depth Profiles

K/J 1365027.00
June 2015

Figure 5

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Legend:

Shallow Monitoring Well Location

RTH #1
977.70 Water Level Elevation (AMSL)

Groundwater Elevation Contour

N

0 300 600
Feet

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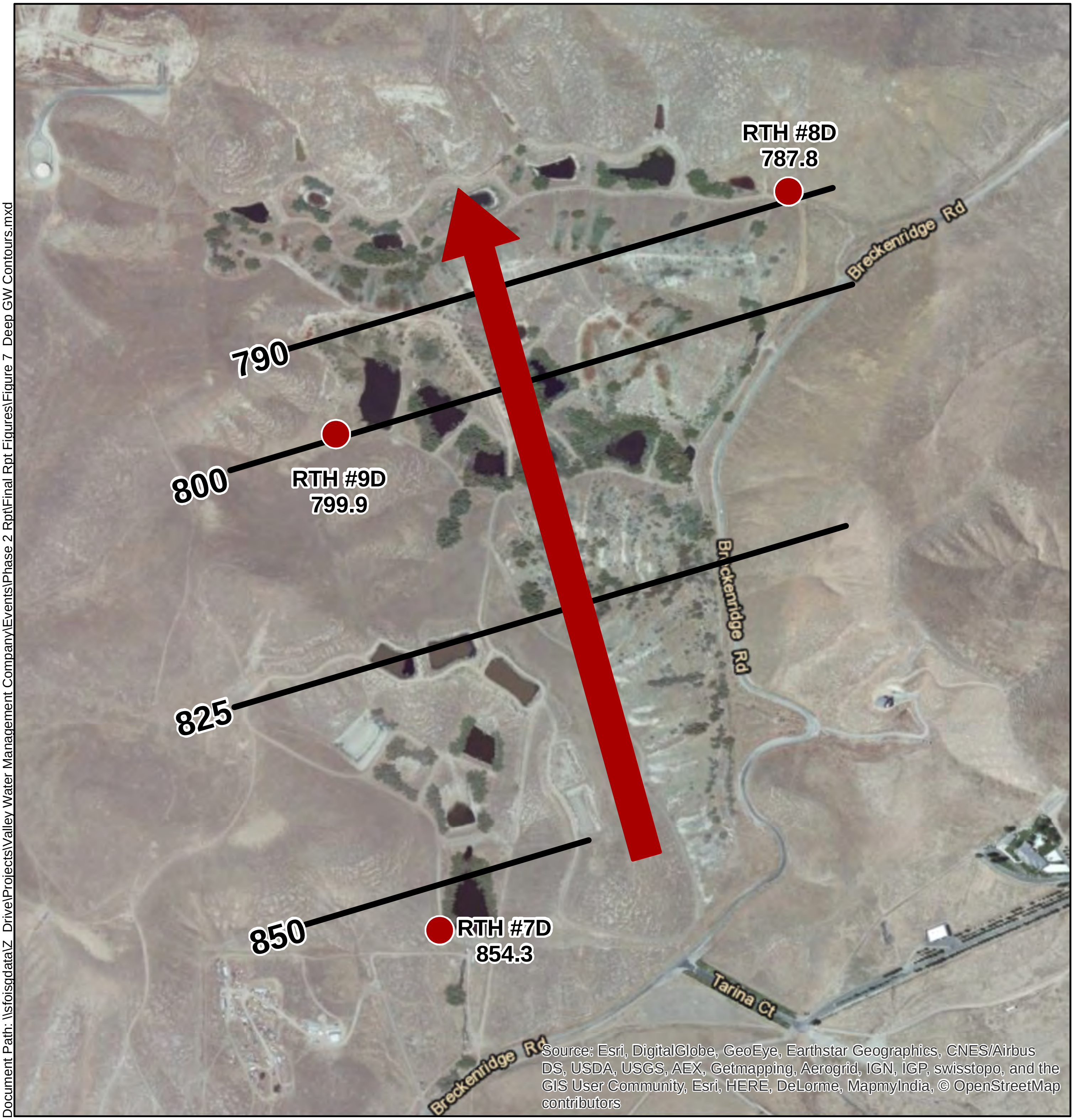
Bakersfield, California

Shallow Groundwater Level and Direction of Groundwater Flow, December 2014

K/J 1365027*00
June 2015

Figure 6

Document Path: \\sfoisgdata\Z_Drive\Projects\Valley Water Management Company\Events\Phase 2 Rpt\Final Rpt Figures\Figure 7_Deep GW Contours.mxd



Legend:

Deep Monitoring Well Location

RTH #7D
854.3
Water Level Elevation (AMSL)

Groundwater Elevation Contour

N

0 300 600
Feet

Note: Groundwater Elevations Measured on 17 March 2015.
Source: Kenneth D. Schmidt & Associates. Deep Well Investigation Report, June 2015.

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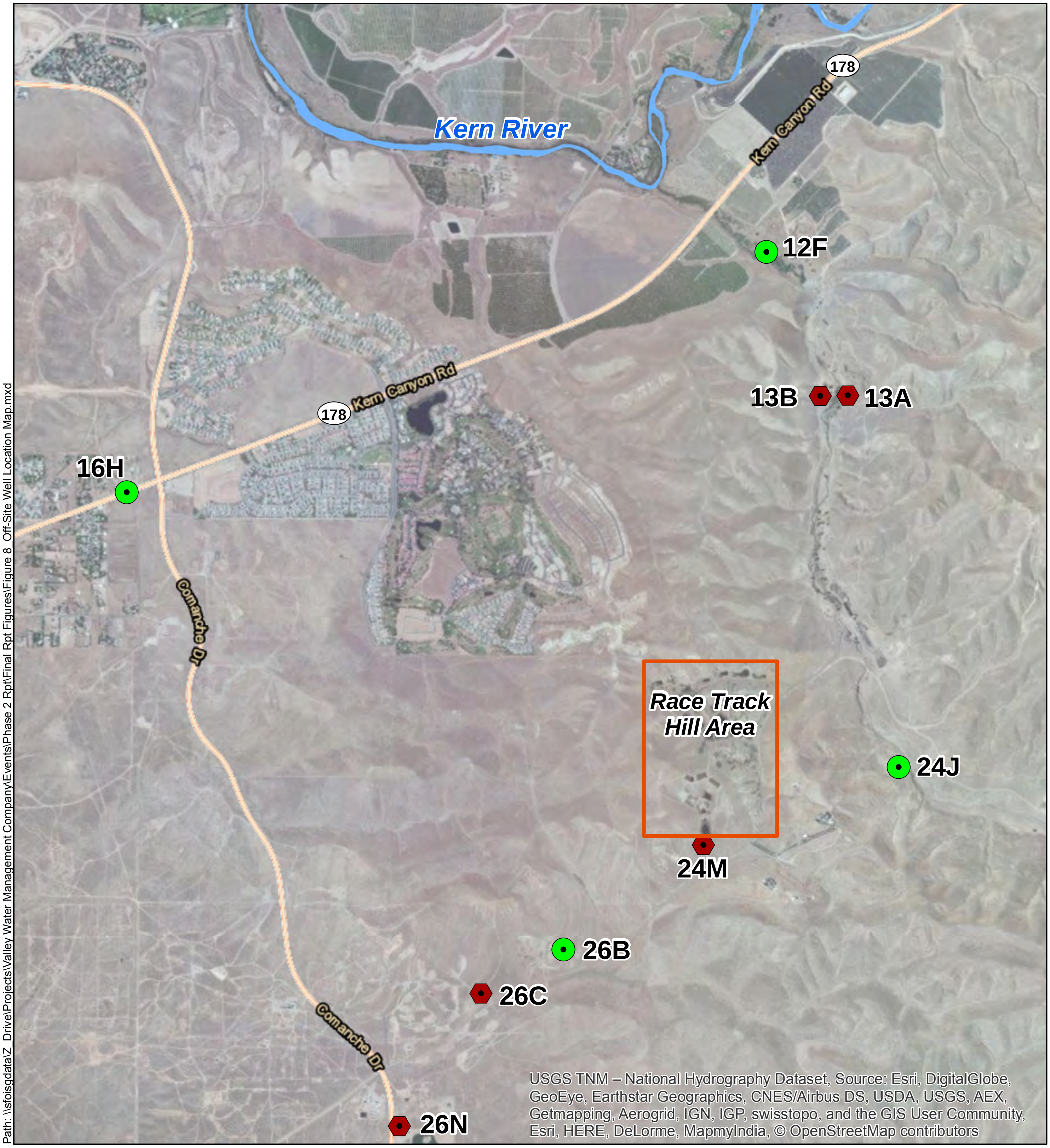
Valley Water Management Company
Bakersfield, California

Deep Groundwater Level and Direction of Groundwater Flow, March 2015

K/J 1365027*00
June 2015

Figure 7



Legend:

Off-Site Well, Sampled

Unused Off-Site Well, Not Sampled

N

0 1,400 2,800

Scale: Feet

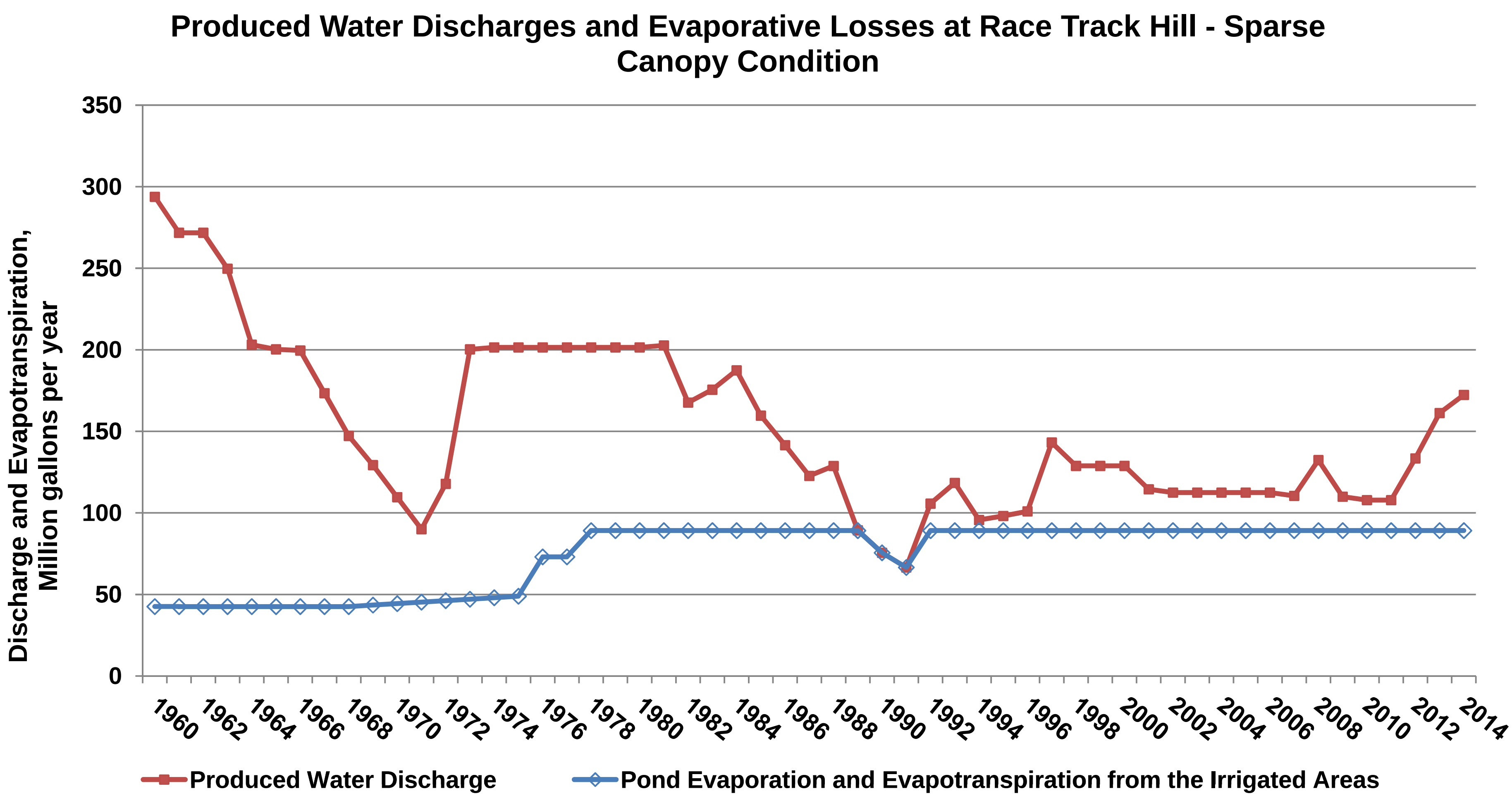
Kennedy/Jenks Consultants

Valley Water Management Company
Bakersfield, California

Off-Site Well Locations

K/J 1365027*00
June 2015

Figure 8



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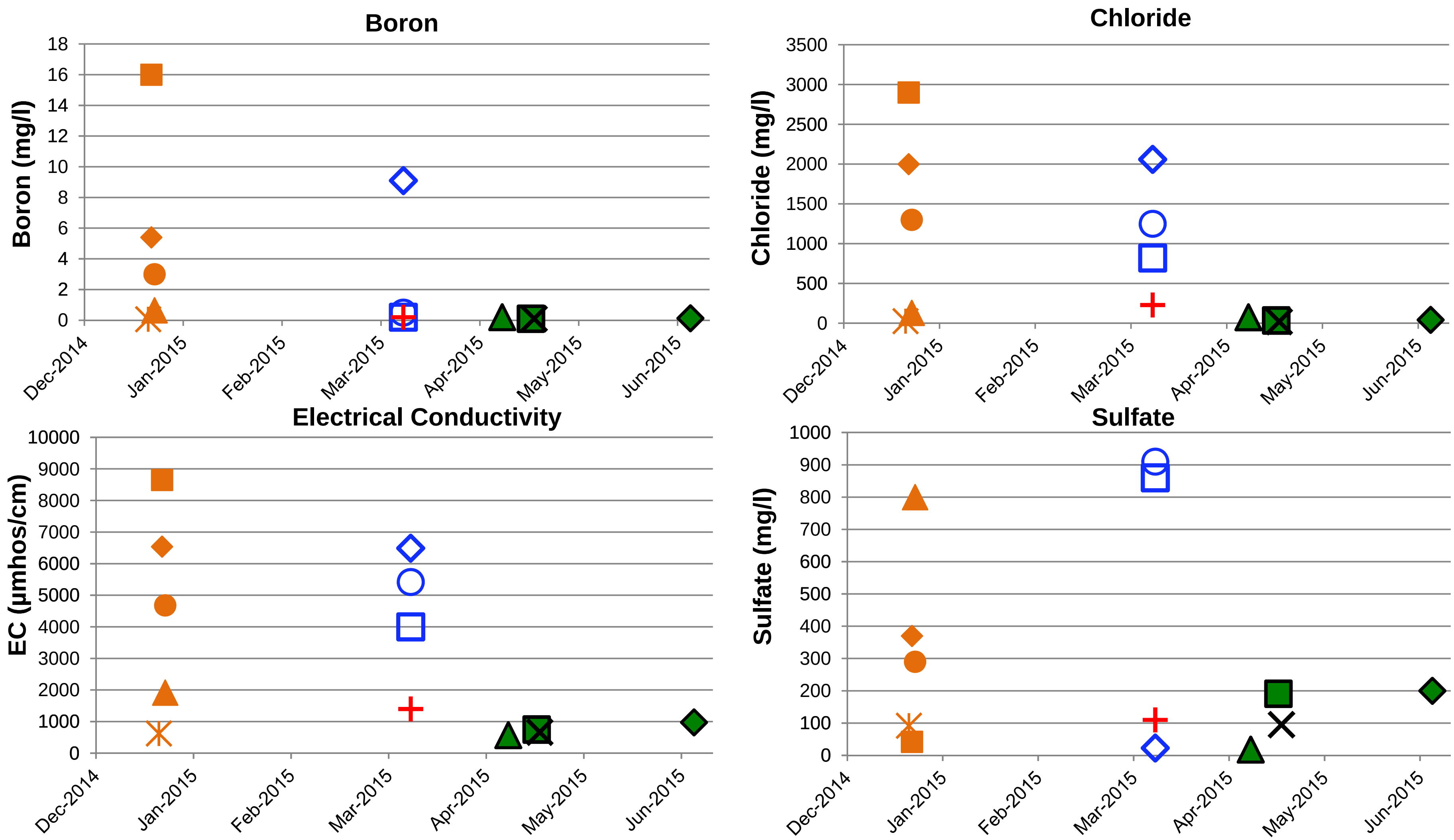
Valley Water Management Company
Bakersfield, California

Produced Water Discharges and Evaporative Losses at Race Track Hill

K/J 1365027*00
June 2015

Figure 9

G:\IS-Group\Admin\Job\13\1365027.00_VWMC\09-Reports\Ph2-Final-Rpt\Figures\Figure 9_Discharge and ET.xlsxFigure 9_Discharge and ET.xlsx



Legend:

RTH #1 RTH #6 RTH #4 RTH #3 RTH #5

RTH #9D RTH #7D RTH #8D 26B 16H

24J 12F C-1D

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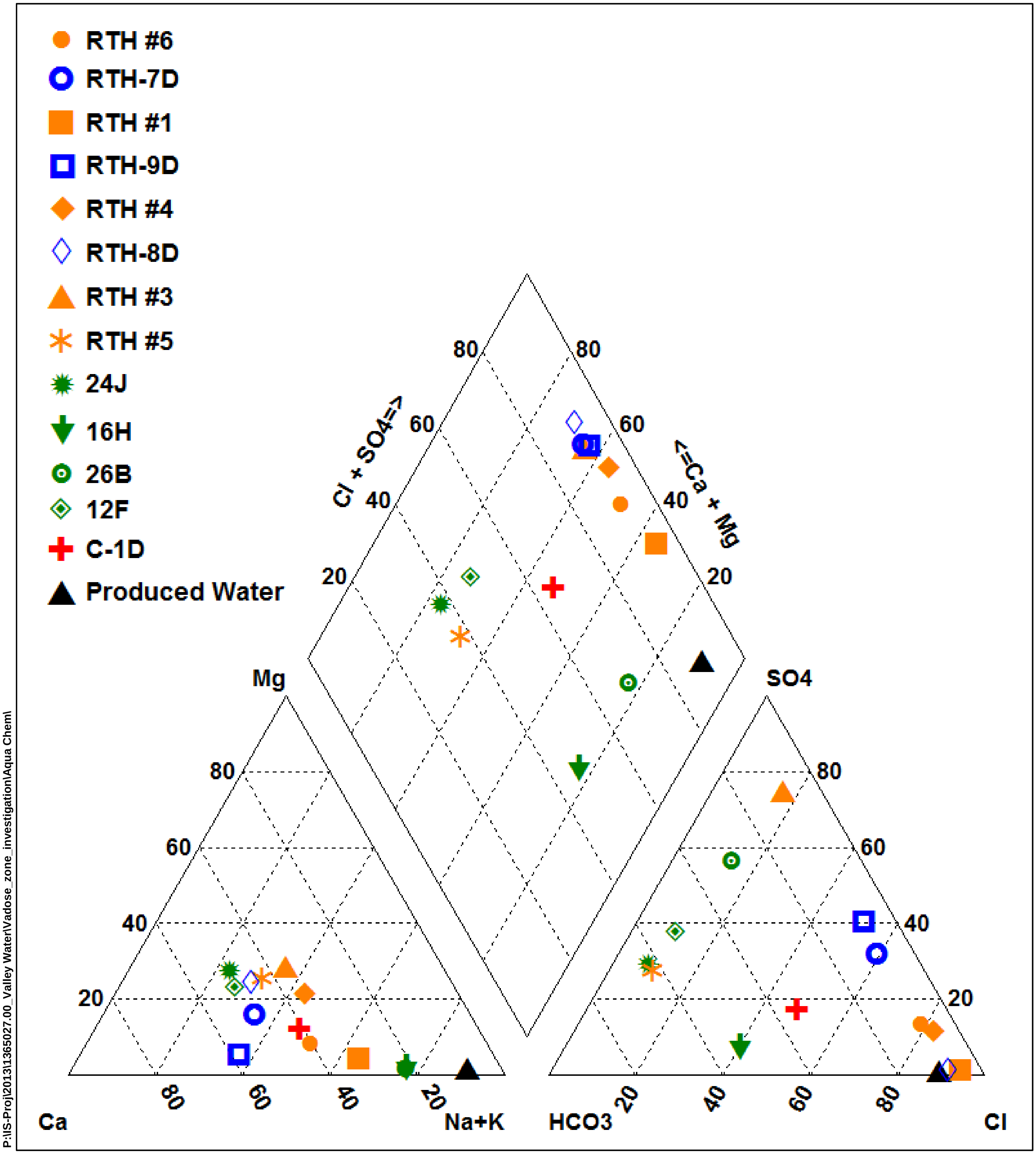
Bakersfield, California

Water Quality Scatter Plots

K/J 1365027*00
June 2015

Figure 10

G:\IS-Group\Admin\Job\13\1365027.00_VWMC\09-Reports\Ph2-Final-Rpt\Figures\Figure 10_WQ Plots.xlsx



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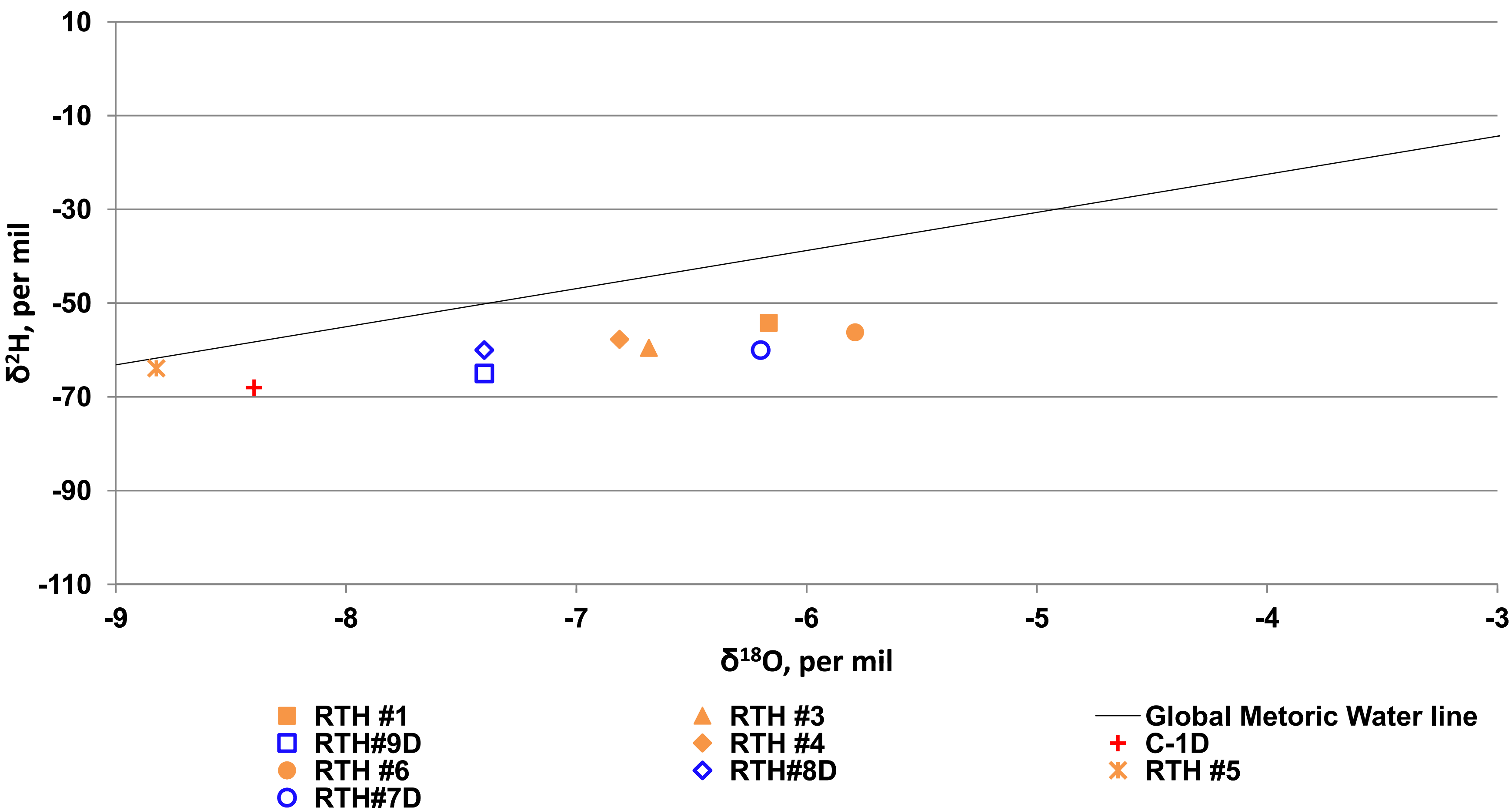
Bakersfield, California

Trilinear Diagram for Monitoring Wells and Off-Site Wells

K/J 1365027*00
June 2015

Figure 11



Notes:

(a) Metoric water line: $\delta^2H=8.13*\delta^{18}O+10.0$: Craig, H. 1961. *Isotopic variations in meteoric waters.* Science, 133, 1702-1703, in http://cierzo.sahra.arizona.edu/programs/isotopes/oxygen.html#5

(b) $\delta^{18}O$ = delta Oxygen-18 ($\delta^{18}O$ = 1000*[($^{18}O/^{16}O$ sample - $^{18}O/^{16}O$ reference) / $^{18}O/^{16}O$ reference])

(c) δ^2H = delta Deuterium (δ^2H = 1000*[($^2H/^1H$ sample - $^2H/^1H$ reference) / $^2H/^1H$ reference])

(d) Sources: Craig, 1961 and Kendall, 2001.

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Bakersfield, California

Stable Isotope Analyses of Groundwater at the Fee 34 and Race Track Hill Facilities

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June 2015

Figure 12

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September 1992


May 2002


September 2002


December 2005


August 2006


April 2008


June 2009


October 2009

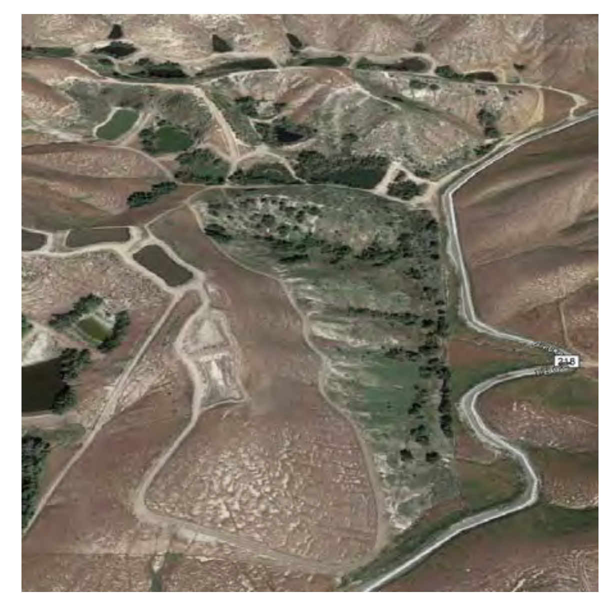

April 2011


August 2012


July 2013


August 2013


April 2014


March 2015

N

Kennedy/Jenks Consultants

Valley Water Management Company
Bakersfield, California

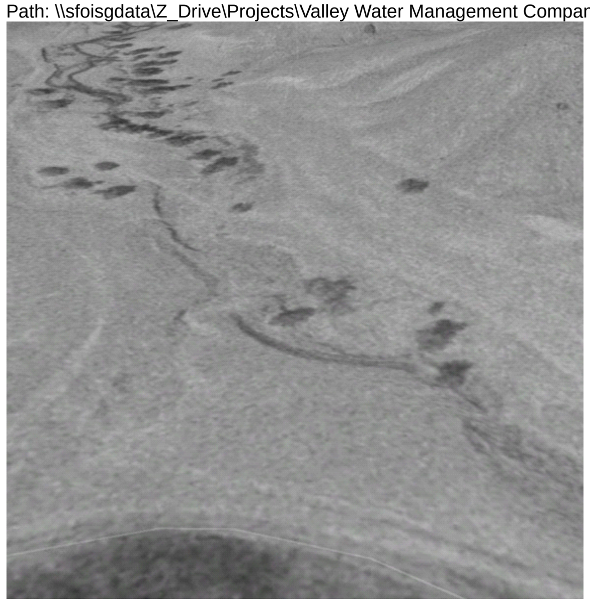
Historical Photos - Race Track Hill

1365027*00
June 2015

Figure 13

Source: Google Earth

Path: \\sfoisgdata\Z_Drive\Projects\Valley Water Management Company\Events\Phase 2 Rpt\Final Rpt Figures\Figure 14_Historical Photos Cottonwood Creek.mxd



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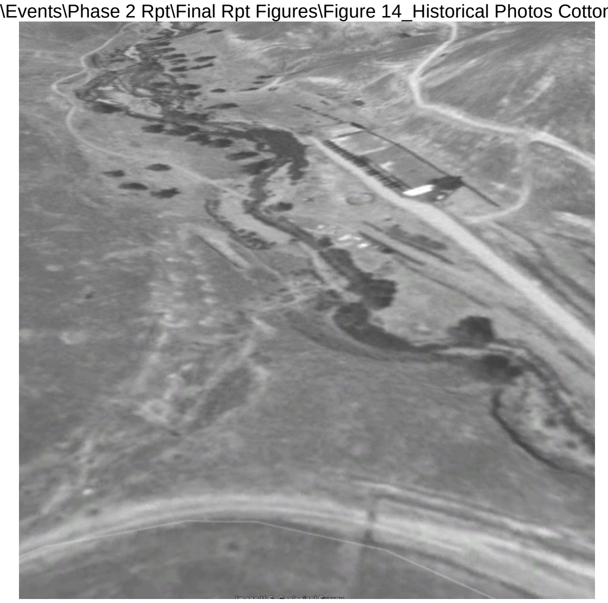


May 2002

September 2002

December 2005

August 2006

April 2008

June 2009

October 2009

April 2011

August 2012

July 2013

August 2013

April 2014

March 2015

N

Source: Google Earth

Kennedy/Jenks Consultants

Valley Water Management Company
Bakersfield, California

Historical Photos - Cottonwood Creek

1365027*00
June 2015

Figure 14

Appendix A

Phase 2 Interim Report

Kennedy/Jenks Consultants
Engineers & Scientists
200 S.W. Market Street, Suite 500
Portland, Oregon 97201
503-423-4000
FAX: 503-295-4901

15 January 2015

Mr. Dane Johnson
Senior Engineering Geologist
Central Valley Regional Water Quality Control Board
1685 E Street
Fresno, California 93706

Subject: Interim Report on Phase 2 Subsurface Investigations at the Valley Water Management Company Edison Oil Field Fee 34 Facility and Race Track Hill
K/J 1365027*00

Dear Mr. Johnson:

This interim report on the Phase 2 Subsurface Investigations: Valley Water Management Company Edison Oil Field, Fee 34 Facility and Race Track Hill is submitted in compliance with the 13267 Order issued to Valley Water Management Company (VWMC) on 1 July 2014. A Work Plan describing the proposed investigations was submitted for Central Valley Regional Water Quality Control Board (Regional Board) approval on 14 November 2014 and reviewed with the Regional Board during a meeting on 2 October 2014. During that meeting, the Regional Board gave conceptual approval to the Phase 2 investigations plan.

Background. VWMC received the 13267 Order on 7 July 2014, and responded to the Regional Board on 29 July 2014 (Letter from Larry Bright, VWMC, to Clay Rodgers, Regional Board, dated 29 July 2014). The purpose of the letter was to once again reiterate the impossibility VWMC faces in complying with the requirement to complete all the work described in the 13267 Order by the final completion date of 15 January 2015 established in the Order.

The basis for our concerns with the schedule contained in the 13267 Order is summarized as follows. The work required to be performed by VWMC in the Order consists of three basic tasks:

1. Conduct investigations and studies necessary to determine whether potential adverse impacts on soil and groundwater quality have occurred.

2. Characterize the nature and extent of release, if any, from the subject facilities.

3. Once the characterization is complete, conduct studies to evaluate what corrective measures, if any, need to be taken to protect existing and potential future uses of impacted soils and groundwater.

Step 2 cannot be undertaken until Step 1 is completed and Step 3 cannot be completed without first completing Step 2. VWMC has worked collaboratively with Regional Board staff to this point and agree that a phased approach is the best approach to conducting the evaluation for VWMC's Edison Oil Field sites, as mentioned in the 13267 Order. VWMC submitted a Work Plan for proposed Phase 2 work and contracted with a drilling company for Phase 2 well installation. Two additional shallow monitoring wells have been installed at Race Track Hill and 4 deep wells will be installed later this month (drillers in the area have been extremely busy so this was the earliest time we could contract for the drill rig specified for the deep wells). Drilling, well construction, development, sampling, and water quality analyses are expected to take 4-6 weeks to complete.

If the Phase 2 investigations do, in fact, result in defining the nature and extent of the release, if any, VWMC will then require a minimum of an additional six months to conduct the evaluation of what, if anything, need be done in response to the release. Alternatively, if the Phase 2 investigations do not adequately define the nature and extent of the release, a third phase of characterization will be required before the evaluation of need for corrective action can commence.

VWMC pursued Phase 1 investigations at Race Track Hill and the Fee 34 Facility in a voluntary manner prior to receiving a 13267 Order in order to hasten the investigations. VWMC intends to continue investigations diligently. Yet in spite of our commitment to continue in this manner, it is not possible for us to comply with the schedule set forth in the Order. The Interim report on subsurface investigations presented in this letter is intended to report our findings to date and our continued diligence in pursuing necessary investigations, in accordance with our Work Plans for drilling and the technical elements of the 13267 Order.

Technical Summary of Subsurface Investigations

Phase 2 Subsurface Investigations at the Valley Water Management Company Edison Oil Field Sites consist of two drilling and monitoring well construction programs. One investigation focuses on the deep aquifers that underlie the Fee 34 Facility and Racetrack Hill. Three wells will be completed at Racetrack Hill and one well will be completed at the Fee 34 Facility (Figure 1). This investigation has not been completed and, therefore, is not discussed in this interim report. The following paragraphs provide a summary of the second subsurface investigation which addresses shallow subsurface stratigraphy and shallow monitoring well construction at the Racetrack Hill Facility. VWMC also identified wells within one mile of the VWMC sites, as required in the 13267 Order. A report on the wells identified was submitted to the Regional Board on 21 August 2014. This report also included a cross section for the Racetrack Hill Area based on local area well logs.

The objective of the Phase 2 shallow groundwater investigation is to provide a further assessment of shallow groundwater conditions down gradient of the Racetrack Hill Site (Figure 1). Two additional shallow groundwater monitoring wells were installed, developed, and surveyed to augment the three monitoring wells installed during Phase 1. New monitoring well RTH#5 was installed northeast of the Site near Cottonwood Creek, and new monitoring well

RTH#6 was installed on the southwest side of the southernmost surface impoundment in the southern drainage (Figure 2). All five shallow monitoring wells were sampled and analyzed in December 2014 for inorganic constituents, Total Petroleum Hydrocarbons as crude oil (TPHc), and isotopic analysis of O^{18} and deuterium.

Results. Boring Logs for the new wells (Attachment A) indicate that RTH#5 is completed in recent alluvium. This alluvium is in a drainage way that trends west to east losing approximately 80 feet elevation between the base of Racetrack Hill and Cottonwood Creek. The boring, which extended to 57 feet below ground surface (bgs), had an initial static water level at 33 feet bgs. The hollow stem auger could not advance past 57 feet bgs so the depth of the recent alluvium overlying the Santa Margarita Formation could not be determined.

Boring RTH#6 was advanced to 144 feet bgs with an initial static water level in the borehole at 120 feet bgs. Based on our boring logs, the sediments encountered are those of the Santa Margarita Formation. No evidence of moisture related to the adjacent produced water percolation was observed in the near surface core samples; no perched water or indication of horizontal movement were observed.

Wells were constructed in borings RTH#5 and RTH#6. Table 1 summarizes well construction details for all shallow wells at Racetrack Hill. The top of casing elevation for RTH#5 is at the lowest elevation of the wells and RTH#6 is at the highest elevation.

Groundwater elevation data for both April 2014 and December 2014 monitoring well sampling events are included in Table 2. Three wells have been sampled twice. Of these, RTH#1 has approximately the same water level in April and December. This is likely due to its location adjacent to an active percolation-evaporation pond that maintains water levels in the area. The two wells at the base of Race Track Hill, RTH#3 and RTH#4, both have static water levels approximately 6 feet lower in December than in April.

Figure 3 shows water level elevations for the December 2014 sampling event. No attempt was made to provide water level contours because there are undefined variables that affect groundwater flow in the area. This includes percolation discharge volume from the 21 ponds at Racetrack Hill, a large elevation change between wells on Racetrack Hill and those in the valley east of Racetrack Hill, and marked differences in subsurface conditions among the well locations.

An important objective of the Phase 2 Work Plan was to determine the flow direction of first-encountered ground water east of Racetrack Hill. Based on December 2014 results from RTH#3, RTH#4, and RTH#5, the apparent flow direction is to the northeast along the same path as the surface drainage way just north of Breckenridge Road. This assumes that groundwater encountered at RTH#5 is hydraulically connected to the groundwater in RTH#3 and RTH#4. This is discussed in the next section.

Water Quality Monitoring Dataset. The results of April 2014 and December 2014 groundwater sampling are shown in Tables 3 and 4. For this interim report, the results of the December 2014 samples will be discussed here. Monitoring wells RTH#1 and RTH#6 are located directly adjacent to produced water percolation-evaporation ponds on Racetrack Hill. Water quality of these wells is expected to be related to the chemistry of produced water. RTH#3 and RTH#4 are at the base of Racetrack Hill and may have water quality affected by more than one water source. The same is true for RTH#5 but this well is much further from Racetrack Hill.

Electrical conductivity (EC) and boron (B) are highest at well RTH#1 and slightly lower at RTH#4 and RTH#6. These parameters are lowest at wells RTH#3 and RTH#5. RTH#5 is much lower in EC and B than all other wells, likely because it is furthest from Racetrack Hill and may not have been influenced by water from the Racetrack Hill ponds. This comparative trend among wells is consistent for a number of constituents including sodium (Na) and chloride (Cl) which are characteristically high in produced water. Calcium and total dissolved solids (TDS) also follow this trend. Nitrate nitrogen, sulfate (SO_4), magnesium (Mg), potassium (K), and alkalinity (HCO_3) all have different trends for the wells completed in first encountered groundwater. SO_4, Mg, K, and HCO_3 all have concentrations equal to or greater than those at RTH#1. This suggests that there are other sources of groundwater that contribute salt ions, particularly at RTH#4.

The relationships among salt ions can be evaluated using a trilinear geochemical analysis (Figure 4). This figure shows that the wells on Racetrack Hill, RTH#1 and RTH#6, consistently plot near each other, because they are chemically similar. Wells RTH#3 and RTH#5 consistently plot at one end of the group of five wells because their geochemistry is markedly different. In addition, RTH#3 and RTH#5 are different from each other because RTH#5 has a geochemical make-up that is distinctly different from all other wells. EC, B, and Cl are much lower than the other wells and indicates that groundwater at this well location comes primarily from sources other than produced water discharge at Racetrack Hill. Well RTH#4 generally falls between the geochemistry of RTH#1/RTH#6 and RTH#3/RTH#5. This well also has higher Mg and SO_4 concentrations than are present in the produced water or at RTH#1.

The sampling plan for the December 2014 sampling event also included TPHc and isotopes of oxygen and hydrogen. TPHc was not detected in any sample above the method reporting limit, 500 µg/l (Table 4).

The preliminary analysis of wells at the Racetrack Hill site indicate that wells located on Racetrack Hill (RTH#1, RTH#6) have characteristics similar to produced water but generally at somewhat lower concentrations. The other wells have chemical differences from produced water that suggest that other groundwater sources are present at these wells. RTH#4 may have another source with elevated K, Mg, and SO_4. RTH#3 may have similar effects but the concentrations of B, Cl, and EC are lower than at RTH#4. This may be due to the distance of RTH#3 from the nearest percolation-evaporation ponds. As mentioned above, RTH#5 has very different water quality than that of the other four wells at Racetrack Hill.

Isotope analyses have not yet been completed by the specialty laboratory. Since isotopic analysis is a key part of evaluating potential component sources of groundwater, any further evaluation of sources of shallow groundwater at and near the Racetrack Hill site will be conducted when the laboratory dataset is complete in early February 2015.

Evaluation of Alternative Discharge Methods

Two discharge alternatives to the Racetrack Hill discharge are under consideration and evaluation by VWMC. We continue to evaluate potential alternatives but, at this time, these have not been demonstrated to be viable.

1. **Produced Water Injection into an Exempt Aquifer.** As a contingency to the potential future loss of the VWMC disposal facility at Racetrack Hill, VWMC has made a decision to attempt to try and permit a Class II UIC disposal well, through DOGGR, at their Section 34 “C Plant” fee property. The purpose of this UIC project is to dispose of water produced from leases in the Edison Oil Field that are a part of the VWMC Racetrack Hill water disposal district. Injection will be into the Santa Margarita formation, which is an exempted aquifer in this portion of the Edison Oil Field. The injection facility would be on VWMC’s “C Plant” property located near the southwest corner of Section 34, T29S/R29E, MDBM, Kern County, California. The proposal is to drill one new well initially, “Fee 34-1”, into the Santa Margarita for testing of the proposed injection zone. VWMC may propose supplemental wells in the future if produced water volumes increase and/or the formation can accept an increase in injected produced water volumes. VWMC estimates that it will take up to two years to permit and drill this proposed disposal well. VWMC has conducted background research on properties and has completed the geological portion of the permit application.

2. **Discharge of Produced Water to an Irrigation District.** VWMC is in discussions with the Arvin-Edison Water Storage District regarding providing them with produced water to augment their irrigation water supply. The blended concentrations are being evaluated to assess agricultural suitability and the mechanics of piping the produced water to Arvin-Edison’s canal system are under review.

Please contact Gary Carlton, Larry Bright, or me if you wish to discuss any aspect of this interim report. VWMC plans to submit a final report on the Phase 2 subsurface characterization activities when the investigations have been completed. We anticipate the report will be submitted between mid-March and early April 2015.

Very truly yours,

KENNEDY/JENKS CONSULTANTS

Stuart W Childs

Stuart W. Childs, PhD
Senior Scientist

Tables:

Table 1: Monitoring Well Completion Details
Table 2: Summary of Groundwater Elevation Data
Table 3: Summary of Monitoring Well Sample Data – Inorganic Analytes
Table 4: Summary of Monitoring Well Sample Data – TPH as Crude Oil Attachments:
Attachment A: RTH # 5 and RTH #6 Boring Logs

Figures:

Figure 1: Site Location Map
Figure 2: Race Track Hill Boring and Well Locations
Figure 3: Groundwater Elevations – December 2014
Figure 4: Geotechnical Analysis of Race Track Hill Groundwater Samples – December 2014

Attachment A: RTH # 5 and RTH #6 Boring Logs

cc: Clay Rodgers, CVRWQCB
Larry Bright, Valley Water Management Company
Jim Waldron, Valley Water Management Company
Gary Carlton, Kennedy/Jenks Consultants

Tables

Table 1: Monitoring Well Completion Details

Well ID	Completion Date	Well Diameter (inches)	Top of Casing Elevation (ft AMSL)(a)	Drilled Depth (ft bgs)(b)	Well Screen		Sand Pack(d)		Bentonite Seal		Grout Seal	
					Top (ft bgs)	Bottom (ft bgs)	Top (ft bgs)	Bottom (ft bgs)	Top (ft bgs)	Bottom (ft bgs)	Top (ft bgs)	Bottom (ft bgs)
RTH#1	04/11/2014	4	1025.85	70.5	50	70	48	70.5	45	48	1.5	45.0
RTH#3	04/22/2014	4	879.39	105.1	84.6	104.6	82	105.1	76.2	82	1	76.2
RTH#4	04/17/2014	4	871.02	150	80	100	78	104	72	78	5	72
RTH#5	12/11/2014	4	810.8	57.4	27	57	24.5	57.4	22.5	24.5	3	22.5
RTH#6	12/10/2014	4	1059.82	145.0	113.5	143.5	111	145.0	107.8	111.0	1	107.8

Notes:

(a) "ft AMSL" denotes feet above mean sea level, NAVD88. RTH#1 through RTH#4 surveyed in June 2014 and RTH#5 and RTH#6 surveyed in December 2014 by Dee Jaspar and Associates.

(b) "ft bgs" denotes feet below ground surface.

Table 2: Summary of Groundwater Elevation Data

Monitoring Well	Measuring Point[a] Elevation (ft AMSL)[b]	Date	Depth to Groundwater (ft TOC)[c]	Groundwater Elevation (ft AMSL)
RTH #1	1025.85	4/30/2014	47.91	977.94
RTH #1	1025.85	12/22/2014	48.15	977.70
RTH #3	879.39	4/29/2014	80.83	798.56
RTH #3	879.39	12/22/2014	87.31	792.08
RTH #4	871.02	4/29/2014	78.45	792.57
RTH #4	871.02	12/22/2014	84.41	786.61
RTH#5	810.80	12/21/2014	33.45	777.35
RTH#6	1059.82	12/22/2014	120.31	939.51

Notes:

(a) Top of PVC Well Casing

(b) ft AMSL = feet above mean sea level, to NAVD88 datum. RTH#1 through RTH#4 surveyed in June 2014 and RTH#5 and RTH#6 were surveyed in December 2014 by Dee Jaspar & Associates.

(c) ft TOC = feet below top of casing

Table 3: Summary of Monitoring Well Sample Data - Inorganic Analytes

Monitoring Well	Sample Date	Sample Name	pH	Electrical Conductivity @ 25°C	Total Dissolved Solids @ 180°C	Calcium	Magnesium	Sodium	Potassium	Boron	Bicarbonate Alkalinity as $CaCO_3$	Carbonate Alkalinity as $CaCO_3$	Chloride	Nitrate as N	Sulfate
			pH Units	µmhos/cm[a]	mg/L[b]	mg/L	mg/L	mg/L	mg/L	mg/l	mg/L	mg/L	mg/L	mg/L	mg/L
Produced Water	10/24/2014	RTH Discharge Water	7.49	5700	3000	100	10	1300	12	13	290	<10[c]	1500	-	18
RTH #1	4/30/2014	RTH-1-140430	7.31	8,690	6,600	560	44	1,100	8.9	16	240	<8.2[c]	2,900	7.1	42
RTH #1	12/22/2014	RTH #1 - 122214	7.26	8,650	7,000	550	45	1,300	9.0	16	220	<8.2	2,900	14	42
RTH #1	12/22/2014	QCFD-01-141222	7.24	8,700	7,000	560	45	1,300	9.0	16	220	<8.2	2,900	11	40
RTH #3	4/29/2014	RTH-3-140429	6.86	2,810	1,900	200	93	280	25	4.1	120	<8.2	510	0.7	680
RTH #3	12/23/2014	RTH#3-122314	6.91	1,920	1,500	170	81	180	22	0.65	100	<8.2	130	0.16	800
RTH #4	4/29/2014	RTH-4-010429	7.52	5,900	4,400	450	170	580	22	6.9	210	<8.2	1,700	8.3	510
RTH #4	4/29/2014	QCFD-01-140429	7.53	5,900	4,100	430	160	560	22	6.8	220	<8.2	1,700	8.4	510
RTH #4	12/22/2014	RTH #4 - 122214	7.38	6,540	5,100	490	180	680	23	5.4	210	<8.2	2,000	3.4	370
RTH #5	12/21/2014	RTH #5 - 122114	7.69	624	450	64	23	51	6.4	0.066	220	<4.1	26	0.57	92
RTH #6	12/23/2014	RTH #6 - 122314	7.34	4,680	3,500	400	48	570	22	3.0	190	<8.2	1,300	23	290

Notes:

(a) µmhos/cm = micromhos per centimeter

(b) mg/l = milligrams per liter

(c) "<10", "<8.2" = not detected above the practical quantitation limit

Table 4: Summary of Monitoring Well Sample Data - TPH as Crude Oil

Monitoring Well	Sample Date	Sample Name	TPH - Crude Oil µg/l[(a)]
RTH #1	4/30/2014	RTH-1-140430	1,300
RTH #1	12/22/2014	RTH #1 - 122214	<500
RTH #1	12/22/2014	QCFD-01-141222	<500
RTH #3	4/29/2014	RTH-3-140429	<500
RTH #3	12/23/2014	RTH#3-122314	<500
RTH #4	4/29/2014	RTH-4-010429	<500
RTH #4	4/29/2014	QCFD-01-140429	<500
RTH #4	12/22/2014	RTH #4 - 122214	<500
RTH #5	12/21/2014	RTH #5 - 122114	<500
RTH #6	12/21/2014	RTH #6 - 122114	<500

Note:
(a) µg/l = micrograms per liter

Figures

Document Path: \\SFOISGDATA\Z_Drive\Projects\Valley Water Management Company\Events\Phase II Subsurf Investigation Rpt Figures\Figure 1_Location Map.mxd

N

0 2,250 4,500

Feet

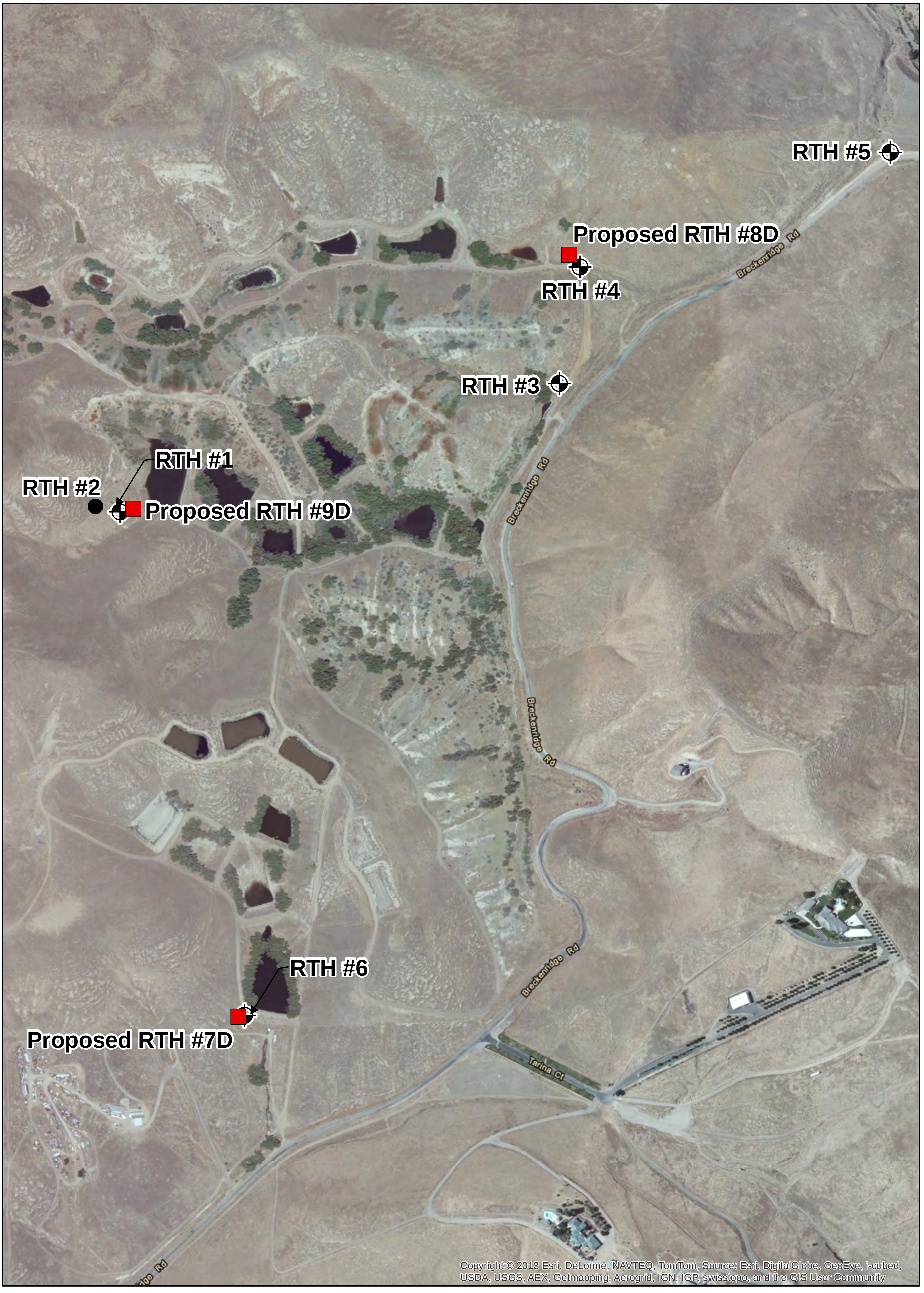
Kennedy/Jenks Consultants

Valley Water Management Company
Bakersfield, California

Site Location Map

K/J 1365027*00
January 2015

Figure 1



Document Path: \\sfoisgdata\Z_Drive\Projects\Valley Water Management Company\Events\Phase II Subsurf Investigation Rpt Figures\Figure 2_Racetrack Hill MW Locations.mxd

Legend:

- Existing Soil Boring Location
- Existing Shallow Monitoring Well Location
- Proposed Deep Monitoring Well Location (to be installed by others)

Note:

1). Race Track Hill Area is located at W1/2 Section 24 T27S R29E WDB&M.

Kennedy/Jenks Consultants

Valley Water Management Company
Bakersfield, California

Race Track Hill Boring and Well Locations

K/J 1365027*00
January 2015

Figure 2

Document Path: \\sfoisgdata\Z_Drive\Projects\Valley Water Management Company\Events\Phase II Subsurf Investigation Rpt Figures\Figure 3_GW Elevations.mxd

Legend:

Shallow Monitoring Well Location

RTH #1 (977.70) Groundwater Elevation (FT AMSL)

N

0 200 400
Feet

Note:

1). Race Track Hill Area is located at W1/2 Section 24 T27S R29E WDB&M.

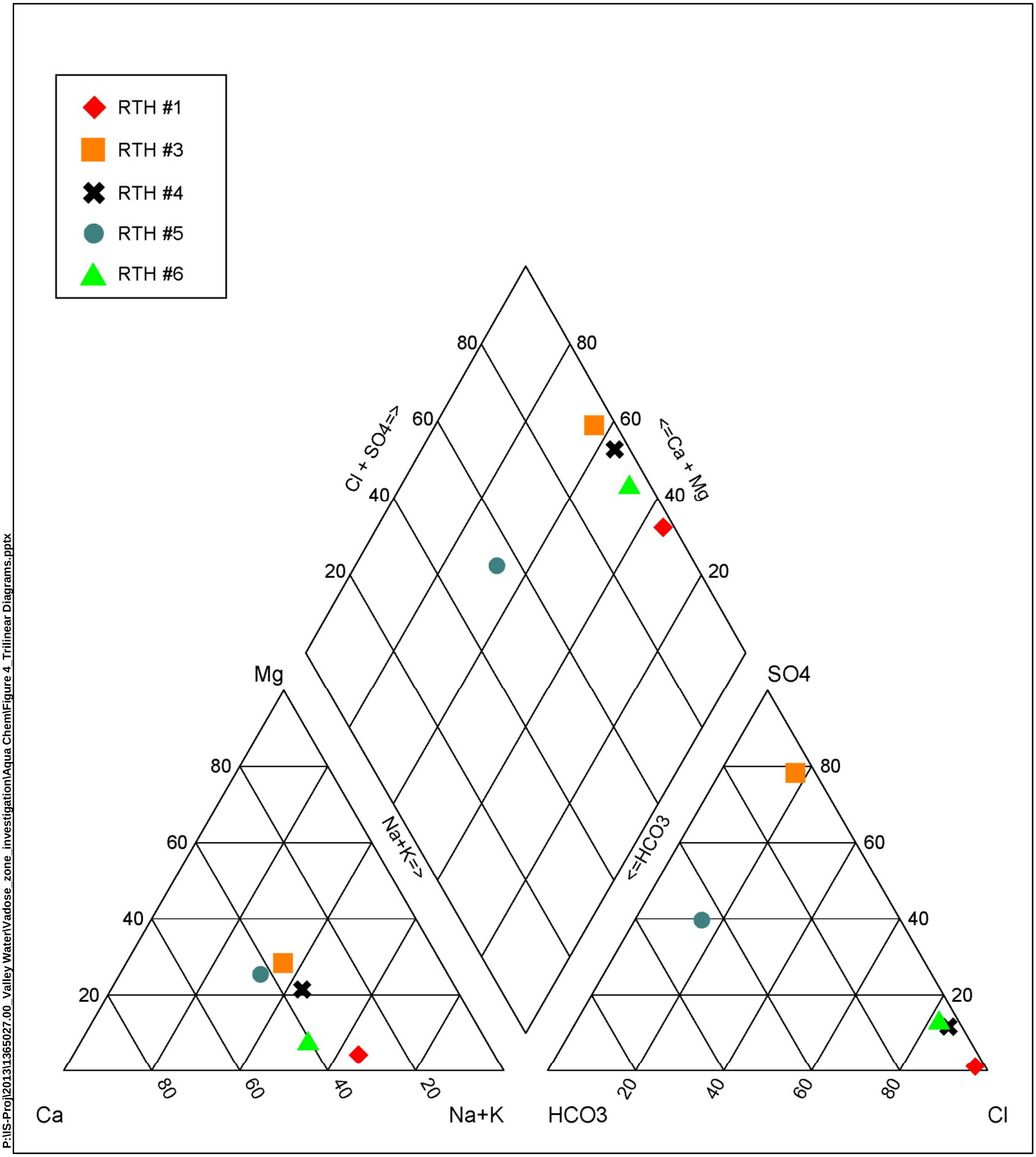
Kennedy/Jenks Consultants

Valley Water Management Company
Bakersfield, California

Groundwater Elevations
December 2014

K/J 1365027*00
January 2015

Figure 3



P:\IS-Proj\2013\1365027.00_Valley Water\Vadose_zone_investigation\Aqua Chem\Figure 4_Trilinear Diagrams.pptx

Kennedy/Jenks Consultants

Valley Water Management Company
Bakersfield, California

Geochemical Analysis of Racetrack Hill Groundwater Samples – December 2014

K/J 1365027*00
January 2015

Figure 4

Attachment A

RTH #5 and RTH #6 Boring Logs

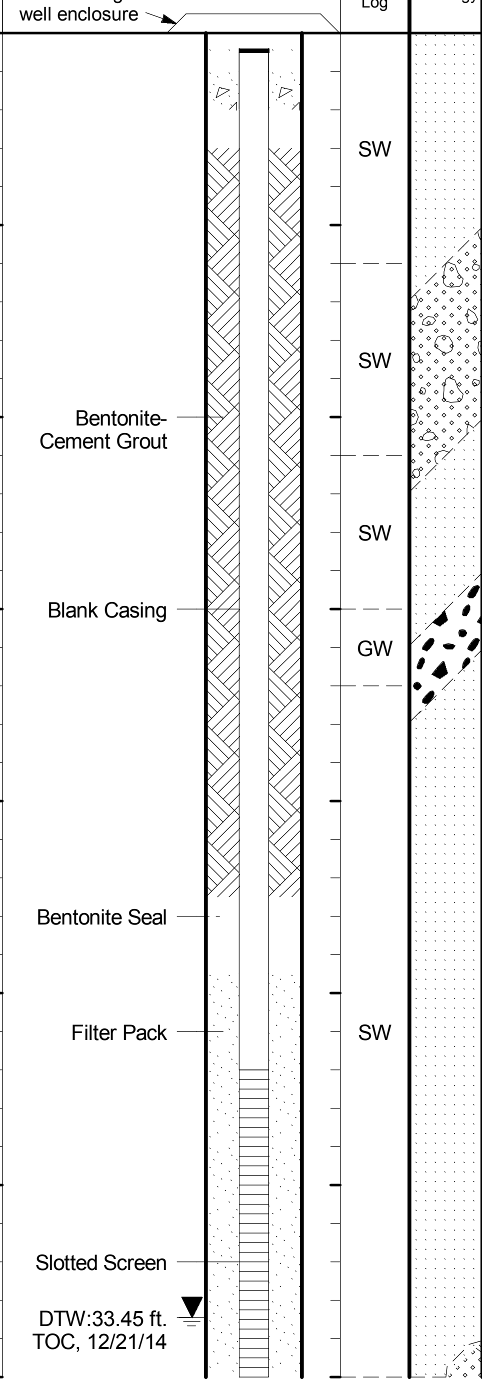
Boring & Well Construction Log

Kennedy/Jenks Consultants

BORING LOCATION: Breckenridge Road		Well Name: RTH#5
DRILLING COMPANY: Gregg Drilling and Testing	DRILLER: J. Sifuentes	Project Name: Valley Water Management Co.
DRILLING METHOD(S): Hollow Stem Auger - CME 95	DRILL BIT(S) SIZE: Reamed with 10-in. augers	Project Number: 1365027.00

Item	Description	FROM	TO	FT.
ISOLATION CASING	n/a	n/a	n/a	
BLANK CASING	4-inch SCH 40 PVC	0.5	27.0	
SLOTTED CASING	4-inch SCH 40 PVC 0.010-inch slotted	27.0	57.0	
SIZE AND TYPE OF FILTER PACK	Cemex #2/12	24.5	57.4	
SEAL	Wyo-Ben Medium Bent. Chips	22.5	24.5	
GROUT	3% Bentonite Cement Grout	3	22.5	

ELEVATION AND DATUM: TOC: 810.80 ft. AMSL	TOTAL DEPTH: 57.4 ft. bgs
DATE STARTED: 12/11/14	DATE COMPLETED: 12/11/14
STATIC WATER ELEVATION: 777.35 ft. AMSL	NORTH: 2332160.899
LOGGED BY: M. McLeod	EAST: 6319525.753
SAMPLING METHODS: Continuous coring	WELL COMPLETION: ☒ SURFACE HOUSING ☐ STAND PIPE n/a FT.



SAMPLES Type & No.	Recovery (Feet)	Penetr. Resist. Blows/6"	Drill Depth (Feet)	USCS Log	Color	SAMPLE DESCRIPTION and DRILLING REMARKS
	5		0–5	SW	10YR 7/4	**WELL GRADED SAND (SW)** VERY PALE BROWN OVERALL, <~5% GRAVEL, ~10% COARSE GRAINED SAND, ~20% MEDIUM GRAINED SAND, ~75% FINE GRAINED SAND, DRY
	2		5–10	SW	10YR 6/3 10YR 8/1	**GRAVELLY WELL GRADED SAND (SW)** VERY PALE BROWN OVERALL WITH ABUNDANT WHITE, ~10-20% GRAVEL, ~20% COARSE GRAINED SAND, ~23-30 MEDIUM GRAINED SAND, ~30% FINE GRAINED SAND, VERY DENSE AND CONSOLIDATED, DRY
	2		10–15	SW	10YR 6/4	**WELL GRADED SAND (SW)** LIGHT YELLOWISH BROWN, TRACE GRAVEL, <~10% COARSE GRAINED SAND, ~10-20% MEDIUM GRAINED SAND, ~70% FINE GRAINED SAND, VERY DENSE AND CONSOLIDATED, DRY
	No Core		15–20	GW		**GRAVEL (GW)** 15 FT. DRILL STRING RATTLES VIOLENTLY; ABUNDANT GRAVEL IN CUTTINGS. DRILL WITHOUT SAMPLER; VERY ROCKY TO 17 FT. AND LESS ROCKY BELOW
	2		20–21	SW		**WELL GRADED SAND (SW)** VERY PALE BROWN OVERALL WITH BROWNISH YELLOW STREAKS, TRACE GRAVEL, <~10% COARSE GRAINED SAND, ~60-70% MEDIUM GRAINED SAND, ~10-20% FINE GRAINED SAND, VERY DENSE AND CONSOLIDATED, DRY, SUBHORIZONTAL BROWNISH YELLOW STREAKING
	No Core		21–25			
	1		25–30	SW	10YR 7/3-7/4 10YR 6/8	GRAVEL INCREASES TO ~10-20%, UP TO 2.5-INCHES DIAMETER
	1.5		30–35			

Project Name Valley Water Management Co. **Project Number** 1365027.00 **Well Name** RTH#5

SAMPLES Type & No.	Recovery (Feet)	Penetr. Resist. Blows/6"	Drill Depth (Feet)	WELL CONSTRUCTION	USCS Log	Lithology	Color	SAMPLE DESCRIPTION and DRILLING REMARKS
	2			First Encountered Water				**GRAVELLY WELL GRADED SAND (SW)** YELLOW OVERALL WITH BROWNISH YELLOW STREAKS, ~20% GRAVEL TO 2-INCHES, ~10%20%~ COARSE GRAINED SAND, ~70% FINE GRAINED SAND, VERY DENSE, MOIST, ABUNDANT COARSE FELDSPAR AND QUARTZ
	No Core							
	1		40				10YR 7/6	41 FT. MATERIAL IS WET. WATER LEVEL MEASURED AT APPX. 37 FT.
	No Core						10YR 6/8	MATERIAL IS DENSE AND GRAVELLY-CANNOT PENETRATE WITH SAMPLE BARREL SO START ALTERNATING CORING/NON CORING RUNS
	No Core		45	Filter Pack	SW			
	1.5		50	Slotted Screen				50 FT. COLOR CHANGES TO BROWNISH YELLOW
	No Core						10YR 6/8	
	No Core		55					57 FT. AUGER REFUSAL

NOTES
1. ALL CONTACTS APPROXIMATE
2. BGS: BELOW GROUND SURFACE
3. COLOR DESIGNATION IN ACCORDANCE WITH THE MUNSELL SOIL COLOR CHARTS (KOLLMORGEN INSTRUMENTS CORPORATION, 1990)
4. SOIL CLASSIFIED IN ACCORDANCE WITH THE UNIFIED SOIL CLASSIFICATION SYSTEM, ASTM D-2488-93

Boring & Well Construction Log

Kennedy/Jenks Consultants

BORING LOCATION: Race Track Hill		Well Name: RTH#6
DRILLING COMPANY: Gregg Drilling and Testing	DRILLER: J. Sifuentes	Project Name: Valley Water Management Co.
DRILLING METHOD(S): Hollow Stem Auger - CME 95	DRILL BIT(S) SIZE: Reamed with 10-in. augers	Project Number: 1365027.00
ISOLATION CASING: n/a	FROM n/a TO n/a FT.	ELEVATION AND DATUM: TOC: 1059.82 ft. AMSL / TOTAL DEPTH: 145.0 ft. bgs
BLANK CASING: 4-inch SCH 40 PVC	FROM +2.1 TO 113.5 FT.	DATE STARTED: 12/8/14 / DATE COMPLETED: 12/8/14
SLOTTED CASING: 4-inch SCH 40 PVC 0.010-inch slotted	FROM 113.5 TO 143.5 FT.	STATIC WATER ELEVATION: 939.51 ft. AMSL / NORTH: 2328430.428
SIZE AND TYPE OF FILTER PACK: Cemex #2/12	FROM 111.0 TO 145.0 FT.	LOGGED BY: M. McLeod / EAST: 6316629.347
SEAL: Wyo-Ben Medium Bent. Chips	FROM 107.8 TO 111.0 FT.	SAMPLING METHODS: Continuous coring / WELL COMPLETION: ☐ SURFACE HOUSING ☒ STAND PIPE 3 FT.
GROUT: 3% Bentonite Cement Grout	FROM 1 TO 107.8 FT.	

WELL CONSTRUCTION: Stand pipe; Well cap; Bentonite-Cement Grout (15 ft); Blank Casing (20 ft)

Recovery (Feet)	Drill Depth (Feet)	USCS Log	Color	SAMPLE DESCRIPTION and DRILLING REMARKS
5	0–5	SM	10YR 5/4	**SILTY SAND (SM)** YELLOWISH BROWN, TRACE COARSE GRAINED SAND, ~10-20% MEDIUM GRAINED SAND, ~60-70% FINE GRAINED SAND, ~10% NON-PLASTIC FINES, DRY
4	5	SW	10YR 7/3	**WELL GRADED SAND (SW)** VERY PALE BROWN OVERALL, ~10-20% COARSE GRAINED SAND, ~20% MEDIUM GRAINED SAND, ~70% FINE GRAINED SAND, VERY DENSE AND CONSOLIDATED
5	10	ML	2.5Y 6/3	**SANDY SILT (ML)** LIGHT YELLOWISH BROWN OVERALL, ~20-30% FINE GRAINED SAND, ~70% NON-PLASTIC FINES, CEMENTED, BRITTLE, AND FRIABLE; BREAKS INTO SUBHORIZONTAL CHIPS
4	15	ML	2.5Y 5/4, 10YR 8/1	**SANDY SILT (ML)** LIGHT OLIVE BROWN AND WHITE, ~40% COARSE GRAINED SAND TO MEDIUM GRAINED SAND WHITE FELDSPAR AND QUARTZ; ~60% LIGHT OLIVE BROWN SILT MATRIX, VERY STIFF, NO PLASTICITY, DRY
5	20	SW	10YR 6/3, 10YR 5/8	**WELL GRADED SAND WITH GRAVEL (SW)** PALE BROWN OVERALL WITH YELLOWISH BROWN STREAKS, ~20% GRAVEL, ~20% COARSE GRAINED SAND (MAINLY WHITE FELDSPAR), ~30% MEDIUM GRAINED SAND (INC. SOME MICAS), ~30% FINE GRAINED SAND, VERY DENSE AND CONSOLIDATED 23 FT. SOME SUBHORIZONTAL COLOR BANDING
4	25	SM	2.5Y 6/3, 10YR 5/8	**SILTY SAND (SM)** LIGHT YELLOWISH BROWN AND YELLOWISH BROWN BANDING, ~80% FINE GRAINED SAND INC. MICAS, ~20% NON-PLASTIC FINES, DRY
4.5	30–35	SW	10YR 6/3, 10YR 5/8	**WELL GRADED SAND WITH GRAVEL (SW)** PALE BROWN OVERALL WITH YELLOWISH BROWN STREAKS, ~20% GRAVEL, ~20% COARSE GRAINED SAND (MAINLY WHITE FELDSPAR), ~30% MEDIUM GRAINED SAND (INC. SOME MICAS), ~30% FINE GRAINED SAND, VERY DENSE AND CONSOLIDATED

BORING & WELL CONSTRUCTION 1365027.00.GPJ KENNEDY JENKS.GDT 1/7/15

Boring & Well Construction Log

Kennedy/Jenks Consultants

Project Name Valley Water Management Co. **Project Number** 1365027.00 **Well Name** RTH#6

SAMPLES Type & No.	Recovery (Feet)	Penetr. Resist. Blows/6"	Drill Depth (Feet)	WELL CONSTRUCTION	USCS Log	Color	SAMPLE DESCRIPTION and DRILLING REMARKS
	4				SM	2.5Y 6/3	**SILTY SAND (SM)** LIGHT YELLOWISH BROWN AND WHITE, ~15% WHITE MEDIUM GRAINED SAND FELDSPAR, ~70% LIGHT YELLOWISH BROWN FINE GRAINED SAND, ~15% NON-PLASTIC FINES, MOIST?
	5		40		SW	10YR 6/3 10YR 5/8	**WELL GRADED SAND WITH GRAVEL (SW)** PALE BROWN OVERALL WITH YELLOWISH BROWN STREAKS, ~20% GRAVEL, ~20% COARSE GRAINED SAND (MAINLY WHITE FELDSPAR), ~30% MEDIUM GRAINED SAND (INC. SOME MICAS), ~30% FINE GRAINED SAND, VERY DENSE AND CONSOLIDATED
					SM	2.5Y 6/3	**SILTY SAND OR SILTY SAND WITH CLAY (SM)** LIGHT YELLOWISH BROWN OVERALL, ~80% FINE GRAINED SAND INC. MICA, ~20% SILT AND SOME CLAY, VERY STIFF/DENSE, NO TO LOW PLASTICITY
	5		45		SM	2.5Y 5/3	**SILTY SAND (SM)** LIGHT OLIVE BROWN AND WHITE, ~80% FINE GRAINED SAND INC. MICA, ~20% NON-PLASTIC FINES, BRITTLE AND BREAKS INTO SUBHORIZONTAL CHIPS
					ML	2.5Y 6/3	**SANDY SILT (ML)** LIGHT YELLOWISH BROWN OVERALL, ~10% SCATTERED WHITE MEDIUM GRAINED SAND, ~20-30% SCATTERED FINE GRAINED SAND, ~60% NON-PLASTIC FINES AND POSS. CLAY, VERY STIFF, NO PLASTICITY, DRY
	4.5		50		ML	2.5Y 5/3 2.5Y6/8	**SILT TO SANDY SILT (ML)** LIGHT OLIVE BROWN OVERALL, ~5-10% FINE GRAINED SAND, ~80-90% SILT, VERY STIFF AND BRITTLE
					ML	2.5Y 6/3	52 FT. - 54 FT. COLOR INCLUDES OLIVE YELLOW
	4.5		55	Bentonite-Cement Grout	SM	2.5Y 6/2 2.5Y 7/2	**SANDY SILT (ML)** LIGHT YELLOWISH BROWN OVERALL, ~10-20% SCATTERED WHITE AND BLACK MEDIUM GRAINED SAND, ~80% NON-PLASTIC FINES, VERY STIFF, NO PLASTICITY **SILTY SAND (SM)** LIGHT BROWNISH GRAY TO LIGHT BROWN, ~60% FINE GRAINED SAND INC. MICAS, ~40-20% NON-PLASTIC FINES, MOIST TO DRY
			60	Blank Casing	SW	2.5Y 6/2	**WELL GRADED SAND (SW)** LIGHT BROWNISH GRAY OVERALL, ~20% COARSE GRAINED SAND, ~40% MEDIUM GRAINED SAND, ~40% FINE GRAINED SAND, VERY DENSE, DRY
	4				SM	2.5Y 5/3	**SILTY SAND (SM)** LIGHT OLIVE BROWN AND WHITE, ~40% WHITE COARSE GRAINED SAND - MEDIUM GRAINED SAND FELSPAR AND QUARTZ; ~60% LIGHT OLIVE BROWN FINE GRAINED SAND AND NON-PLASTIC FINES
	3.5		65				**WELL GRADED SAND WITH GRAVEL (SW)** LIGHT GRAY WITH OLIVE YELLOW STAINS AND BLACK AND WHITE GRAINS, ~10% GRAVEL, ~20% COARSE GRAINED SAND, ~60% MEDIUM GRAINED SAND, ~10-20% FINE GRAINED SAND, VERY DENSE AND CONSOLIDATED
	3.5		70		SW	2.5Y 7/2 2.5Y 5/8 10YR 8/1	
	5		75		SM	2.5Y 6/3 2.5Y 6/8	**SILTY SAND (SM)** LIGHT YELLOWISH BROWN OVERALL WITH SOME SUBHORIZONTAL BANDING AND OLIVE YELLOW STAINING, ~80-90% FINE GRAINED SAND, ~10-20% NON-PLASTIC FINES
			80		SM	2.5Y 5/3	**SILTY SAND (SM)** LIGHT OLIVE BROWN AND WHITE,

BORING & WELL CONSTRUCTION 1365027.00.GPJ KENNEDY JENKS.GDT 1/7/15

F-40.1
(6-87) (3-88) (8-90)

Project Name Valley Water Management Co. **Project Number** 1365027.00 **Well Name** RTH#6

SAMPLES Type & No.	Recovery (Feet)	Penetr. Resist. Blows/6"	Drill Depth (Feet)	WELL CONSTRUCTION	USCS Log	Lithology	Color	SAMPLE DESCRIPTION and DRILLING REMARKS
	4				SW		2.5Y 7/2 2.5Y 5/8 10YR 8/1	~40% WHITE COARSE GRAINED SAND - MEDIUM GRAINED SAND FELDSPAR AND QUARTZ; ~60% LIGHT OLIVE BROWN FINE GRAINED SAND AND NON-PLASTIC FINES **WELL GRADED SAND WITH GRAVEL (SW)** LIGHT GRAY WITH OLIVE YELLOW STAINS AND BLACK AND WHITE GRAINS, ~10% GRAVEL, ~20% COARSE GRAINED SAND, ~60% MEDIUM GRAINED SAND, ~10-20% FINE GRAINED SAND, VERY DENSE AND CONSOLIDATED
	3		85		SM		2.5Y 5/2	**SILTY SAND (SM)** GRAYISH BROWN AND WHITE, ~20% WHITE COARSE GRAINED SAND - MEDIUM GRAINED SAND FELDSPAR AND QUARTZ; ~40-60% GB FINE GRAINED SAND AND ~40% GB NON-PLASTIC FINES
	4		90	Bentonite-Cement Grout	SW		2.5Y 7/2 10YR 8/1	**WELL GRADED SAND WITH GRAVEL (SW)** LIGHT GRAY WITH BLACK AND WHITE GRAINS, ~10% GRAVEL, ~20% COARSE GRAINED SAND, ~60% MEDIUM GRAINED SAND, ~10-20% FINE GRAINED SAND, VERY DENSE AND CONSOLIDATED
	4.5		95	Blank Casing				
					SM		2.5Y 5/2	**SILTY SAND (SM)** GRAYISH BROWN OVERALL, TRACE COARSE GRAINED SAND, ~10-20% MEDIUM GRAINED SAND, ~70% FINE GRAINED SAND, ~20% NON-PLASTIC FINES, VERY DENSE, DRY
	4		100		SW		2.5Y 7/2 10YR 8/1	**WELL GRADED SAND WITH GRAVEL (SW)** LIGHT GRAY WITH BLACK AND WHITE GRAINS, <10% GRAVEL, ~20% COARSE GRAINED SAND, ~60% MEDIUM GRAINED SAND, ~10-20% FINE GRAINED SAND, VERY DENSE AND CONSOLIDATED
	4		105					
	3		110	Bentonite Seal Filter Pack				
	3		115	Slotted Screen	SW		2.5Y 6/2	**WELL GRADED SAND WITH SILT (SW)** LIGHT BROWNISH GRAY OVERALL, TRACE GRAVEL, TRACE COARSE GRAINED SAND, ~10-20 MEDIUM GRAINED SAND, ~70% FINE GRAINED SAND, ~10% NON-PLASTIC FINES, VERY DENSE, DRY
	1		120	DTW: 120.31 ft. TOC, 12/22/14 First Encountered Water	SW		2.5Y 7/2 10YR 8/1	**WELL GRADED SAND WITH GRAVEL (SW)** LIGHT GRAY WITH BLACK AND WHITE GRAINS, ~10% GRAVEL, ~20% COARSE GRAINED SAND, ~60% MEDIUM GRAINED SAND, ~10-20% FINE GRAINED SAND, VERY DENSE AND CONSOLIDATED 120-125 FT. DRILL WITHOUT SAMPLING DUE TO DENSITY AND GRAVEL BLOCKAGE 125 FT. AFTER LUNCH BREAK SOUND WATER LEVEL AT 123 FT. BGS
			125					

BORING & WELL CONSTRUCTION 1365027.00.GPJ KENNEDY JENKS.GDT 1/7/15

Project Name Valley Water Management Co. **Project Number** 1365027.00 **Well Name** RTH#6

SAMPLES Type & No.	SAMPLES Recovery (Feet)	SAMPLES Penetr. Resist. Blows/6"	Drill Depth (Feet)	WELL CONSTRUCTION	USCS Log	Lithology	Color	SAMPLE DESCRIPTION and DRILLING REMARKS
	3							**WELL GRADED SAND WITH GRAVEL** CONT'D 125-130 FT. SAMPLER BARREL IS WET
	3		130				2.5Y 7/2 10YR 8/1	
	No core		135	Filter Pack	SW			135-140 FT. DRILL WITHOUT SAMPLING DUE TO DENSITY AND GRAVEL BLOCKAGE
	3		140	Slotted Screen			2.5Y 6/2 10YR 8/1	140 FT. COLOR CHANGES TO LIGHT BROWNISH GRAY WITH WHITE AND BLACK GRAINS
			145					

NOTES

1. ALL CONTACTS APPROXIMATE
2. BGS: BELOW GROUND SURFACE
3. COLOR DESIGNATION IN ACCORDANCE WITH THE MUNSELL SOIL COLOR CHARTS (KOLLMORGEN INSTRUMENTS CORPORATION, 1990)
4. SOIL CLASSIFIED IN ACCORDANCE WITH THE UNIFIED SOIL CLASSIFICATION SYSTEM, ASTM D-2488-93

Appendix B

Report on Phase 2 Installation of Shallow Monitor Wells
at Race Track Hill

Kennedy/Jenks Consultants

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Shallow Monitoring Well Installation Report Race Track Hill Area, Edison Oil Field California

30 June 2015

Prepared for

Valley Water Management Company
7500 Meany Avenue
Bakersfield, California 93308

K/J Project No. 1365027*00

Table of Contents

List of Tables

List of Figures

List of Appendices

Section 1: Introduction

This *Shallow Monitoring Well Installation Report* (Report) has been prepared by Kennedy/Jenks Consultants (Kennedy/Jenks) for the Race Track Hill Facility, one of the two Valley Water Management Company (VWMC) sites that serve the Edison Oilfield east of Bakersfield, California (Figure B-1).

The Race Track Hill location is shown on Figure B-1. It is located approximately four miles northeast of the Fee 34 Facility, from which it receives treated oilfield produced water, and discharges the treated water to surface impoundments where the water is distributed to percolation/evaporation ponds or spray irrigation areas for evapotranspiration. The Race Track Hill Facility is regulated by Central Valley Regional Water Quality Control Board (RWQCB) Resolution No. 58-349.

On 1 July 2014, the RWQCB issued a California Water Code Directive pursuant to Section 13267 (13267 Order) (CVRWQCB 2014) to VWMC. This 13267 Order required that VWMC develop a Work Plan for additional investigations at the Fee 34 and Race Track Hill facilities. Prior to the 13267 Order, VWMC had been conducting investigations on a voluntary basis but with the input of RWQCB staff and management. The 13267 Order also required that investigations and reporting be completed by 15 January 2015.

The initial investigations (the Phase 1 investigation) conducted at the site provided an assessment of potential soil and groundwater impacts caused by site operations. The Phase 1 investigation results were presented in the *Phase 1 Subsurface Investigation Report at the Fee 34 Facility and Race Track Hill Area, Edison Oil Field, California* dated 1 August 2014 (Kennedy/Jenks 2014a).

The Phase 1 report recommended additional groundwater investigation. The shallow groundwater investigation was described in the *Phase 2 Investigation Work Plan* (Work Plan) dated 10 November 2014 (Kennedy/Jenks 2014b). Phase 2 included installation and sampling of shallow monitoring wells (discussed in this Report), and a separate program of deep monitoring well installation (in preparation by others).

This Report discusses the installation, development, surveying, and initial sampling of the shallow monitoring wells. Synthesis of the findings of the shallow and deep monitoring wells will be prepared in a separate report.

Section 2: Site Descriptions and Field Investigations

2.1 Race Track Hill Site

The Race Track Hill site consists of 338.4 acres (Assessor's Parcel Number 387-060-031) in the western half of Section 24, T29S, R29E, MDB&M. The Race Track Hill Facility is in an area of steep and rolling topography (Figure B-2). Produced water flow from the Fee 34 site enters Race Track Hill at a netted pond at a higher elevation than the highest point where water can be applied on the site. As a result, distribution of all discharges on the site can be conducted via gravity.

There are 27 unlined surface impoundments used for produced water percolation and evaporation. The ponds lie along several existing drainageways that are usually dry except for the percolation ponds. In addition, there are 94 acres with sprinkler irrigation systems that are also used for land application. Salt-tolerant local grasses and some shrubs take up water from the soil to meet their evapotranspiration needs.

2.2 Shallow Groundwater Phase 2 Field Investigations

The objective of the shallow groundwater Phase 2 investigation was to further assessment of shallow groundwater downgradient of the Site. Two new shallow groundwater monitoring wells were installed, developed, and surveyed; and all shallow monitoring wells were sampled. Samples were analyzed for inorganic constituents, Total Petroleum Hydrocarbons as crude oil (TPHc), and isotopic analysis of O^{18} and deuterium. New monitoring well RTH#5 was installed north of the Site near Cottonwood Creek, and new monitoring well RTH#6 was installed on the southwest side of the southernmost surface impoundment in the southern drainage (Figure B-2).

Well construction details are summarized in Table B-1.

Section 3: Field Activities

Details of the completed field investigations are presented in this section. In addition, sampling procedures and analytical methods are discussed.

3.1 Pre-Field Activities

Kennedy/Jenks performed the following activities prior to commencing fieldwork.

- Updated the site-specific Health and Safety Plan.
- Well installation permits (Appendix B-1) were obtained from Kern County.
- The boring locations were checked for potential location conflicts with subsurface utilities by performing a utility clearance check at each location prior to drilling. The survey was done by contacting USA Alert and a private subsurface utility locating service.
- Subcontracted with Gregg Drilling and Testing Inc. (Gregg Drilling) of Signal Hill, California to perform the boring and well construction fieldwork.
- Arranged with ELAP-certified BC Laboratories, Inc. (BC Laboratories) of Bakersfield to provide laboratory analytical services for water samples.
- Arranged with the University of Arizona Environmental Isotope Laboratory to analyze samples for oxygen and hydrogen isotopes.

3.2 Soil Borings and Well Construction Methods

3.2.1 Soil Boring Drilling and Sampling

Gregg Drilling advanced the borings using a CME-95 drill rig and 8-inch diameter hollow stem augers. The soil was cored with a 5-foot long CME core barrel. The core at each boring was laid on plastic sheeting for logging and a small portion was placed in a sealed plastic bag. The borings were reamed with 10-inch diameter augers after the coring was completed. Boring and well construction logs are included in Appendix B-1.

3.2.2 Well Installation

Each well was constructed with new, 4-inch diameter SCH 40 PVC. Each well screen was 20 feet in length, and the annular space around the well screen was filled with clean, graded Cemex #2/12 filter pack sand up to 1-2 feet above the well screen. Well RTH#1 had 0.020-inch slots and the others had 0.010-inch slots. Each filter pack interval was overlain with three to four feet of bentonite pellets or chips, which were allowed to hydrate prior to pouring the sanitary seal. The sanitary seal was composed of 3-5% bentonite-cement grout, which was installed using a tremie pipe. Well RTH#6 was completed with an above-ground steel standpipe and RTH#5 was completed with a traffic-rated flush monument. Each well was surged using a swab tool sized for the well casing diameter after the filter pack was installed and prior to the bentonite seal installation.

3.2.3 Well Development

The wells were developed on 23 and 24 April 2014. Gregg developed each monitoring well by bailing, surging, and pumping until the water turbidity was less than five nephelometric turbidity units (NTU). The pH, temperature, conductivity, and dissolved oxygen were recorded. The development logs are included in Appendix B-2.

3.2.4 Surveying

The location and well casing elevations of the new monitoring wells were horizontally and vertically surveyed by a licensed land surveyor (Dee Jaspar and Associates, Bakersfield, California). The ground surface and top of well casing elevation were surveyed to the nearest 0.01 foot relative to mean sea level. The ground surface and top of casing were surveyed to the North American Vertical Datum (NAVD) 1988, relative to the nearest benchmark for the Site. The horizontal location of each new well was surveyed relative to the California Coordinate system to 0.1 foot precision. Appendix B-3 presents the elevations measured by the surveyor.

3.2.5 Monitoring Well Groundwater Sampling and Analysis

Kennedy/Jenks collected samples from all of the site wells on 21 through 23 December 2014 in accordance with the Work Plan. At least three casing volumes were removed from each well with a Grundfos Redi-flo submersible pump.

The field parameters, pH, temperature, electrical conductivity, dissolved oxygen, and oxidation-reduction potential, were monitored during purging to document stabilization. The documentation is included in Appendix B-4. Laboratory reports are included in Appendix B-5.

3.2.6 Residuals Management

Residuals generated as a result of these activities included soil cuttings and core, decontamination water, and development and purge water from the monitoring wells.

Cuttings were piled up near each drill site for onsite distribution by VWMC. Drilling and sampling equipment was decontaminated near the ponds at Race Track Hill and overspray drained to the ponds. Development and purge water was temporarily contained at each well site then transported to a nearby percolation pond and discharged.

3.2.7 Quality Assurance/Quality Control Procedures

The laboratory followed their standard internal QA/QC procedures during sample analysis, including elements such as analyzing method blanks and control spikes, where appropriate.

All reported results were acceptable. In some cases, practical quantitation limits or method detection limits were raised due to sample dilution or matrix interference. Boron recovery in the matrix spike (MS) and matrix spike duplicates (MSD) was estimated. Evaluation of calcium and sodium the matrix spike/matrix spike duplicate samples could not be performed because the constituent was present in the sample at more than four times the spike concentration.

Section 4: Findings of the Field Investigations

This section presents the findings of the shallow well installation and sampling.

4.1 Soil Stratigraphy at Race Track Hill

Two soil borings were drilled and converted to monitoring wells. Well RTH#5 was located in the Kern County right-of-way on the north side of Breckinridge Road approximately 0.5 miles northeast of the northeasternmost pond of the Race Track Hill facility. The well is located at ground elevation is 811 feet above mean sea level (AMSL), as Breckenridge Road makes a gradual descent from the Race Track Hill Facility along a drainage toward the Cottonwood Creek valley.

Well RTH#6 was located at the west side of the berm of the southernmost pond of the southern drainage. It was sited to assess local groundwater quality in the vicinity of the pond.

RTH#5. The subsurface at RTH#5 consisted of sand and gravel mixtures. Recovered gravels measured up to 2.5-inches diameter and larger gravels and cobbles were probably present, based upon the resistance met by the drill rig. The materials observed in this boring are consistent with alluvial sediment derived from the nearby Santa Margarita Formation.

Water was first encountered at 41 feet below ground surface (bgs) and later measured at 37 feet bgs. The drill was unable to penetrate deeper than 57 feet bgs due to the gravelly and cobbly subsurface so the well screen was set from 27 feet bgs to 57 feet bgs.

RTH#6. RTH#6 was drilled approximately 50 feet southwest of the southernmost percolation pond of the southern valley at a ground surface elevation of 1,057 feet AMSL. At this location, groundwater was encountered at 123 feet bgs and the boring was advanced to 145 feet bgs.

Near the surface the material was mainly silty sand to 17 feet bgs, and composed mainly of well graded sand from 17 to 43 feet bgs. Between 43 feet bgs and 65 feet bgs, the material was a mix of silt/fine sand mixtures. The material was very dense, very stiff, and in some cases broke into brittle thin layers. Abundant weathered feldspar was present.

Below 65 feet the material was mainly well graded sand with gravel some silty sand layers. The material was very dense and consolidated, keeping the ‘core’ shape after removal from the core barrel.

Water was encountered at 123 feet bgs and the well was screened from 113.5 feet bgs to 143.5 feet bgs.

4.2 Groundwater Sampling Results

4.2.1 Groundwater Elevation

Groundwater elevation data for both April 2014 and December 2014 monitoring well sampling events are included in Table B-2. Three wells have been sampled twice. Of these RTH#1 has approximately the same water level in April and December, likely due to its location adjacent to an active percolation pond that maintains water levels in the area. The two wells at the base of Race Track Hill, RTH#3 and RTH#4, both have static water levels approximately 6 feet lower in December than in April.

Figure B-3 shows water level elevations for the December 2014 sampling event. No attempt was made to provide water level contours because there are too many variables that affect groundwater flow in the area: a large percolation volume in the 21 ponds at Race Track Hill, a large elevation change between wells on Race Track Hill and those in the valley east of Race Track Hill, and marked differences in subsurface conditions among the well locations.

4.2.2 Groundwater Sample Analytical Results

The results of April 2014 and December 2014 groundwater sampling are shown in Table B-3 and Table B-4.

EC and TDS are highest at well RTH#1 and slightly lower at RTH#4 and RTH#6. These parameters are lowest at wells RTH#3 and RTH#5. RTH#5 is much lower in EC and TDS than all other wells, likely because it is furthest from Race Track Hill and influenced by water from other sources. This comparative trend among wells is consistent for a number of constituents including boron and chloride. Calcium and sodium also follow this trend. Nitrate nitrogen, sulfate, magnesium, potassium, and alkalinity all have different trends.

4.3 Isotopic Analysis

4.3.1 Introduction

Isotopic composition is determined by measuring the atom ratio of a minor abundance isotope to a major abundance isotope. For oxygen, the ratio measured is $^{18}O/^{16}O$, i.e. the atom ratio of Oxygen-18 to Oxygen-16 (Singleton et al. 2013). For hydrogen, the ratio measured is $^{2}H/^{1}H$, i.e. the atom ratio of hydrogen-2 to hydrogen-1. Hydrogen-2 is also referred to as deuterium (D).

Isotope ratios are reported in the standard delta (δ) notation as parts per thousand (per mil or ‰) variations relative to a reference material of known composition. For oxygen and hydrogen in water, the Vienna Standard Mean Ocean Water (VSMOW; Craig, 1961) is used as a reference (Singleton et al. 2013).

4.3.2 Results from Race Track Hill

The isotopic data from shallow monitoring wells at Race Track Hill is summarized in Table B-5 and graphed on Figure 6. Figure 6 also shows the Global Meteoric Water Line (GMWL) (Craig, 1961). The $\delta^{18}O$ in groundwater samples ranged from -5.6 ‰ in RTH#6 to -8.8 ‰ in RTH#5. The $\delta^{2}H$ ranged from -54 in RTH#1 to -64 in RTH#5. Isotopes were not analyzed in the produced water sample.

Section 5: Conclusions

The following conclusions are based upon the findings of this investigation:

- Two additional shallow monitoring wells (RTH#5 and RTH#6) were installed in the shallow aquifer at Race Track Hill.
- A total of four shallow monitoring wells are present onsite and one is located offsite.
- The groundwater quality in the RTH#5 is unlike the quality of the onsite wells and RTH#3.
- The groundwater quality in RTH#6 is more similar to RTH#1.

Section 6: Recommendations

The following recommendations are based upon the results presented above:

- Continue groundwater monitoring.
- Evaluate the produced water quality in the ponds.
- Submit a report evaluating shallow groundwater, deep groundwater, offsite groundwater, and produced water quality, and their relation to each other.

A detailed work plan should be prepared prior to conducting any further subsurface investigations.

References

Craig, H. 1961. *Standard for Reporting Concentrations of Deuterium and Oxygen-18 in Natural Waters*. Science, 133, p. 1833-1834.

Central Valley Regional Water Quality Control Board (CVRWQCB, 2014). California Water Code Directive Pursuant to Section 13267 – Valley Water Management Company. Fee 34 Facility and Race Track Hill Area, Edison Oil Field, Kern County. 1 July 2014.

Kendall, C., Coplen, T.B. 2001. Distribution of Oxygen-18 and Deuterium in River Waters Across the United States. Hydrological Processes, 15, p. 1363-1393.

Kennedy/Jenks Consultants. 2014a. *Phase 1 Subsurface Investigation Report at the Fee 34 Facility and Race Track Hill Area, Edison Oil Field, California.* 1 August 2014.

Kennedy/Jenks Consultants. 2014b. *Phase 2 Investigation Work Plan.* 10 November 2014.

Singleton, M.J., Roberts, S.K., Moran, J.E., Esser, B.K. 2013. California GAMA Domestic Wells: Nitrate and Water Isotopic Data for Tulare County. Lawrence Livermore National Laboratory. January 2011 Revised August 2013.

Tables

Table B-1: Monitoring Well Completion Details

Well ID	Completion Date	Well Diameter (inches)	Top of Casing Elevation (ft AMSL)(a)	Drilled Depth (ft bgs)(b)	Well Screen Top (ft bgs)	Well Screen Bottom (ft bgs)	Sand Pack(d) Top (ft bgs)	Sand Pack(d) Bottom (ft bgs)	Bentonite Seal Top (ft bgs)	Bentonite Seal Bottom (ft bgs)	Grout Seal Top (ft bgs)	Grout Seal Bottom (ft bgs)
RTH#1	04/11/2014	4	1025.85	70.5	50	70	48	70.5	45	48	1.5	45.0
RTH#3	04/22/2014	4	879.39	105.1	84.6	104.6	82	105.1	76.2	82	1	76.2
RTH#4	04/17/2014	4	871.02	150	80	100	78	104	72	78	5	72
RTH#5	12/11/2014	4	810.8	57.4	27	57	24.5	57.4	22.5	24.5	3	22.5
RTH#6	12/10/2014	4	1059.82	145.0	113.5	143.5	111	145.0	107.8	111.0	1	107.8

Notes:

(a) "ft AMSL" denotes feet above mean sea level, NAVD88. RTH#1 through RTH#4 surveyed in June 2014 and RTH#5 and RTH#6 surveyed in December 2014 by Dee Jaspar and Associates.

(b) "ft bgs" denotes feet below ground surface.

Table B-2: Summary of Shallow Groundwater Elevation Data

Monitoring Well	Measuring Point[a] Elevation (ft AMSL)[b]	Date	Depth to Groundwater (ft TOC)[c]	Groundwater Elevation (ft AMSL)
RTH #1	1025.85	4/30/2014	47.91	977.94
RTH #1	1025.85	12/22/2014	48.15	977.70
RTH #3	879.39	4/29/2014	80.83	798.56
RTH #3	879.39	12/22/2014	87.31	792.08
RTH #4	871.02	4/29/2014	78.45	792.57
RTH #4	871.02	12/22/2014	84.41	786.61
RTH#5	810.80	12/21/2014	33.45	777.35
RTH#6	1059.82	12/22/2014	120.31	939.51

Notes:

(a) Top of PVC Well Casing

(b) ft AMSL = feet above mean sea level, to NAVD88 datum. RTH#1 through RTH#4 surveyed in June 2014 and RTH#5 and RTH#6 were surveyed in December 2014 by Dee Jaspar & Associates.

(c) ft TOC = feet below top of casing

Table B-3: Summary of Shallow Monitoring Well Sample Data - Inorganic Analytes

Monitoring Well	Sample Date	Sample Name	pH	Electrical Conductivity @ 25°C	Total Dissolved Solids @ 180°C	Calcium	Magnesium	Sodium	Potassium	Boron	Bicarbonate Alkalinity as $CaCO_3$	Carbonate Alkalinity as $CaCO_3$	Chloride	Nitrate as N	Sulfate
			pH Units	µmhos/cm[(a)]	mg/L[(b)]	mg/L	mg/L	mg/L	mg/L	mg/l	mg/L	mg/L	mg/L	mg/L	mg/L
RTH #1	4/30/2014	RTH-1-140430	7.31	8,690	6,600	560	44	1,100	8.9	16	240	<8.2[(c)]	2,900	7.1	42
RTH #1	12/22/2014	RTH #1 - 122214	7.26	8,650	7,000	550	45	1,300	9.0	16	220	<8.2	2,900	14	42
RTH #1	12/22/2014	QCFD-01-141222	7.24	8,700	7,000	560	45	1,300	9.0	16	220	<8.2	2,900	11	40
RTH #3	4/29/2014	RTH-3-140429	6.86	2,810	1,900	200	93	280	25	4.1	120	<8.2	510	0.7	680
RTH #3	12/23/2014	RTH#3-122314	6.91	1,920	1,500	170	81	180	22	0.65	100	<8.2	130	0.16	800
RTH #4	4/29/2014	RTH-4-010429	7.52	5,900	4,400	450	170	580	22	6.9	210	<8.2	1,700	8.3	510
RTH #4	4/29/2014	QCFD-01-140429	7.53	5,900	4,100	430	160	560	22	6.8	220	<8.2	1,700	8.4	510
RTH #4	12/22/2014	RTH #4 - 122214	7.38	6,540	5,100	490	180	680	23	5.4	210	<8.2	2,000	3.4	370
RTH #5	12/21/2014	RTH #5 - 122114	7.69	624	450	64	23	51	6.4	0.066	220	<4.1	26	0.57	92
RTH #5	6/8/2015	RTH#5-150608													
RTH #6	12/23/2014	RTH #6 - 122314	7.34	4,680	3,500	400	48	570	22	3.0	190	<8.2	1,300	23	290

Notes:

(a) µmhos/cm = micromhos per centimeter

(b) mg/l = milligrams per liter

(c) "<8.2"= not detected above the practical quantitation limit

Table B-4: Summary of Shallow Monitoring Well Sample - TPH as Crude Oil

Monitoring Well	Sample Date	Sample Name	TPH - Crude Oil µg/l[(a)]
RTH #1	4/30/2014	RTH-1-140430	1,300
RTH #1	12/22/2014	RTH #1 - 122214	<500
RTH #1	12/22/2014	QCFD-01-141222	<500
RTH #3	4/29/2014	RTH-3-140429	<500
RTH #3	12/23/2014	RTH#3-122314	<500
RTH #4	4/29/2014	RTH-4-010429	<500
RTH #4	4/29/2014	QCFD-01-140429	<500
RTH #4	12/22/2014	RTH #4 - 122214	<500
RTH #5	12/21/2014	RTH #5 - 122114	<500
RTH #6	12/21/2014	RTH #6 - 122114	<500

Note:
(a) µg/l = micrograms per liter

Table B-5: Summary of Shallow Monitoring Well Sample Data - Oxygen and Hydrogen Isotopes

Monitoring Well	Sample Date	Sample Name	$\delta^{18}O$ [(a)] ‰ [(c)]	$\delta^{2}H$ [(b)] ‰
RTH #1	12/22/2014	RTH #1 - 122214	-6.2	-54
RTH #3	12/23/2014	RTH#3-122314	-6.7	-60
RTH #4	12/22/2014	RTH #4 - 122214	-6.8	-58
RTH #5	12/21/2014	RTH #5 - 122114	-8.8	-64
RTH #6	12/21/2014	RTH #6 - 122114	-5.8	-56

Notes:

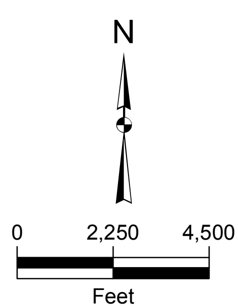
(a) $\delta^{18}O$ = delta Oxygen-18 ($\delta^{18}O = 1000*[(^{18}O/^{16}O \text{ sample} - ^{18}O/^{16}O \text{ reference}) / ^{18}O/^{16}O \text{ reference}]$)

(b) $\delta^{2}H$ = delta Deuterium ($\delta^{2}H = 1000*[(^{2}H/^{1}H \text{ sample} - ^{2}H/^{1}H \text{ reference}) / ^{2}H/^{1}H \text{ reference}]$)

(c) ‰ = per mil

(d) Sources: Craig, 1961 and Vienna Standard Mean Ocean Water

Figures



Kennedy/Jenks Consultants

Valley Water Management Company
Bakersfield, California

Locations of the Valley Water Management Company Edison Oil Field Facilities

K/J 1365027*00
June 2015

Appendix B - Figure 1

Document Path: \\sfoisgdata\Z_Drive\Projects\Valley Water Management Company\Events\Phase 2 Rpt\Final Rpt Figures\Appendix B Figures\Figure 1_Location Map.mxd

Document Path: \\sfoisgdata\Z_Drive\Projects\Valley Water Management Company\Events\Phase 2 Rpt\Final Rpt Figures\Appendix B Figures\Figure 2_RTH Produced Water Disposal Facility.mxd

Legend:

RTH #7D — Deep Monitoring Well Location

RTH #1 — Shallow Monitoring Well Location

Note:

1). Race Track Hill Area is located at W1/2 Section 24 T27S R29E WDB&M.

Kennedy/Jenks Consultants

Valley Water Management Company
Bakersfield, California

Race Track Hill Produced Water Discharge Facility

K/J 1365027*00
June 2015

Appendix B - Figure 2

Document Path: \\sfoisgdata\Z_Drive\Projects\Valley Water Management Company\Events\Phase 2 Rpt\Final Rpt Figures\Appendix B Figures\Figure 3_Shallow GW Elevs.mxd

Legend:

Shallow Monitoring Well Location

RTH #1
977.70
Water Level Elevation (AMSL)

N

0 300 600

Feet

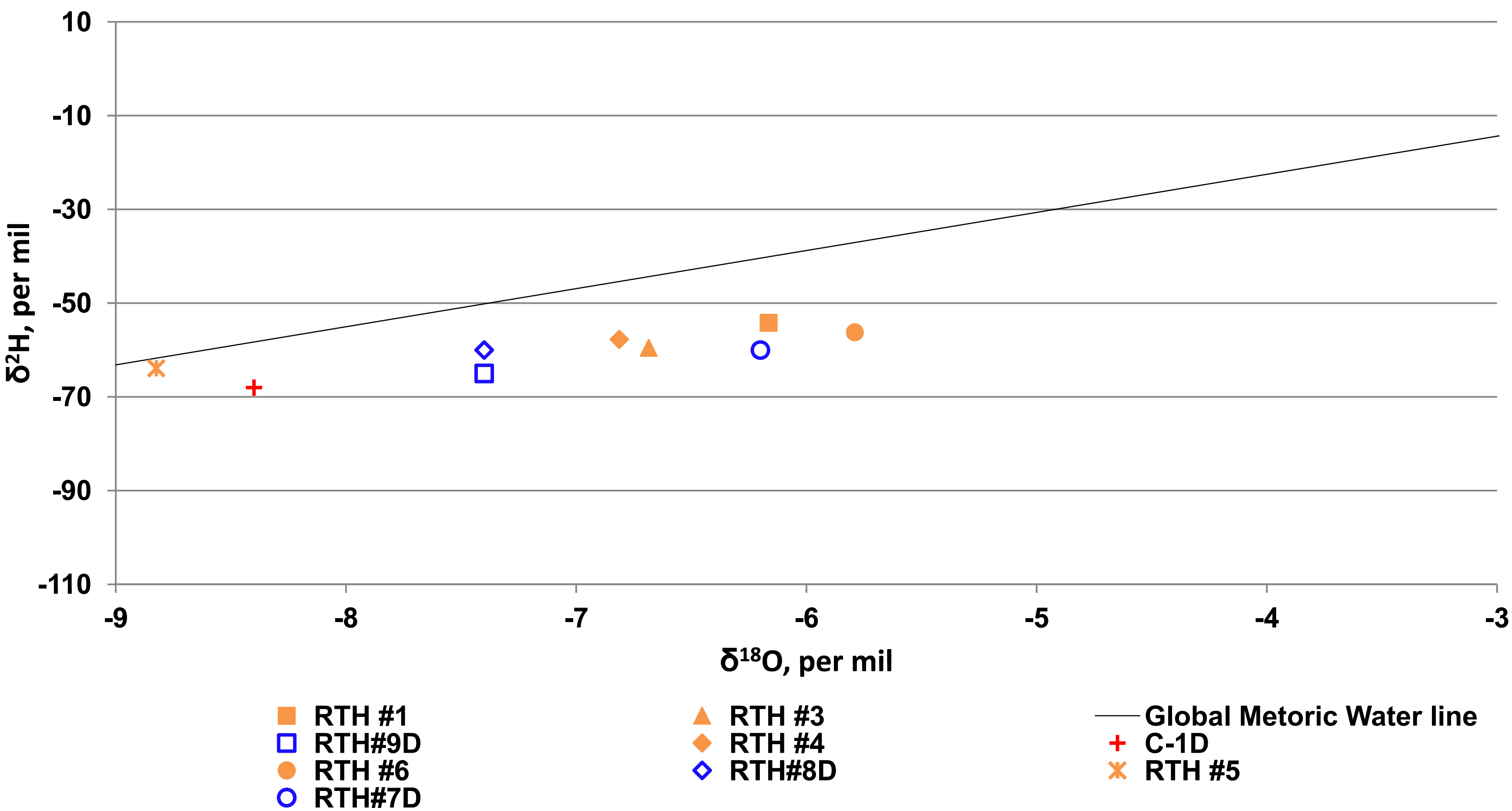
Kennedy/Jenks Consultants

Valley Water Management Company
Bakersfield, California

Shallow Groundwater Elevations
December 2014

K/J 1365027*00
June 2015

Appendix B - Figure 3



Kennedy/Jenks Consultants

Valley Water Management Company
Bakersfield, California

Isotopic Analysis of Groundwater at Fee 34 Facility and Race Track Hill

K/J 1365027*00
June 2015

Appendix B - Figure 4

Notes:

1. Metoric water line: δ2H=8.13*δ18O+10.0: Craig, H. 1961. Isotopic variations in meteoric waters. Science, 133, 1702-1703, in http://cierzo.sahra.arizona.edu/programs/isotopes/oxygen.html#5
2. $\delta^{18}O$ = delta Oxygen-18 ($\delta^{18}O$ = 1000*[($^{18}O/^{16}O$ sample - $^{18}O/^{16}O$ reference) / $^{18}O/^{16}O$ reference])
3. $\delta^{2}H$ = delta Deuterium ($\delta^{2}H$ = 1000*[($^{2}H/^{1}H$ sample - $^{2}H/^{1}H$ reference) / $^{2}H/^{1}H$ reference])
4. ‰ = per mil

Appendix B-1

Permits and Well Construction Logs

WP 15 161

KERN COUNTY
Public Health Services
DEPARTMENT

MATTHEW CONSTANTINE
DIRECTOR

2700 M STREET, SUITE 300 BAKERSFIELD, CALIFORNIA 93301-2370 VOICE: 661-862-8740 FAX: 661-862-8701 WWW.CO.KERN.CA.US/EH

Permit/Well #: WP15761

Starting Date: 12/10/14

APPLICATION FOR WATER WELL PERMIT

APPLICATION MUST BE SUBMITTED AT LEAST TEN (10) WORKING DAYS PRIOR TO THE PROPOSED STARTING DATE

Mark Type of Permit: x Construct New ☐ Reconstruct/Modify ☐ Deepen ☐ Destroy

Type of Well

☐ Domestic/Private (1)
☐ Domestic (2-4 connections)
☐ Domestic (5 or more connections)
☐ Agricultural
☐ Test Hole
x Monitoring
☐ Cathodic Protection
☐ Vadose
☐ Other:

MARK ONE OF THE BOXES BELOW FOR THE PARTY RESPONSIBLE FOR PAYMENT OF FEES

OWNER'S INFORMATION		PROPERTY/FACILITY INFORMATION	
Name	Valley Water Management Co.	Name	Kern County ROW
Address	7500 Meany Ave. Ca	Address	
City / State / Zip	Bakersfield / Ca / 93308	City / State / Zip	
Phone / e-mail	Bright@vwwater.co	APN / T / R / Sec	N/a / 29S / 29E / 24

CONTRACTOR'S INFORMATION

* Environmental Contractor	Kennedy/Jenks Cons. Inc.	Drilling Contractor	Gregg Drilling and Testing
Address	303 Second St. Ste 300 South	Address	2726 Walnut Ave.
City / State / Zip	San Francisco / Ca / 94107	City / State / Zip	Signal Hill / Ca / 90755
Contact / Phone	Mike McLeod / 415-243-2150	Contact / Phone	Joanna McKeehan / 562-427-6899
e-mail	mikemcleod@kennedyjenks.com	e-mail	jmckeehan@greggdrilling.com

LOCATION OF WELL: **TOTAL ACRES:** n/a

Attach a plot plan with the exact location of water well with respect to the following items: property lines, adjoining properties, water bodies or courses, drainage pattern, roads, existing wells, structures, sewers or private disposal systems. **Include dimensions. Draw a 200' radius circle from well site location.** For **monitoring wells** provide a description of the facility to be monitored, including: location of tanks, proposed monitoring and placement, nearest street or intersection, location of any water wells or surface water within 500' radius of facility.

Provide detailed directions to site:

From the intersection of Breckinridge Road and Comanche Drive, go northeast on Breckinridge 2.81 miles.

Well is in shoulder on north side of Breckinridge Rd.

THIS APPLICATION BECOMES A PERMIT WHEN APPROVED

IN0349499

WELL CONSTRUCTION INFORMATION

METHOD: ☐ Reverse Rotary ☐ Rotary ☐ Air Rotary X Hollow Stem Auger ☐ Other:

WELL NAME / NUMBER	RTH#6		
MAXIMUM WELL DEPTH	150		
SEALING MATERIAL	Cement		
SEAL DEPTH (HARD ROCK/ UNCONSOLIDATED)	115		
CASING MATERIAL & GAUGE	SCH40 PVC		
CASING - INSIDE DIAMETER	4"		
SCREEN/PERFORATION DEPTH	120-150		
CONDUCTOR DEPTH	N/a		
CONDUCTOR DIAMETER	N/a		
DEPTH TO GROUNDWATER	Unk., <120		
LOCKING WELL CAP			
BOREHOLE DIAMETER	10"		
SCREEN MATERIAL & GAUGE	SCH40 PVC		
TYPE OF BENTONITE PLUG & DEPTH	Med. Bent. Chips 115-118		
FILTER PACK MATERIAL & SIZE	Cemex #2/12		
SCREEN SLOT SIZE & LENGTH	0.010-in., 30 ft.		
SEALANT PLACEMENT METHOD	Tremie		

WELL DESTRUCTION INFORMATION

WELL NUMBER			
WELL DEPTH			
CASING MATERIAL			
SEALANT MATERIAL			
SEALANT PLACEMENT METHOD			

GENERAL CONDITIONS FOR DESTRUCTION:

1. A well destruction application must be filed with this Division if a well is being destroyed that is not in conjunction with a test hole permit.
2. Destruction procedures must be followed as per UT-50.
3. Placement of the seal must be witnessed by a representative of this Division. Forty-eight hour advanced notice is required for an appointment.

GENERAL CONDITIONS FOR ALL PERMITS:

Permit applications may be submitted to the Planning Department by county staff for zoning, access, and flood plain clearances prior to approval of the Environmental Health Division (EHD). If you are drilling within city's limits, you will have to receive approval from their Planning Department.

1. Permit applications must be submitted to EHD at least ten (10) working days prior to the proposed starting date.
2. Well site approval is required before beginning any work related to water well construction. It is unlawful to continue work past the stage at which an inspection is required unless inspection is waived or completed.
3. Other required inspections include: setting conductor casing, E-Logs, all seals, and final construction features.
4. In areas where a water well penetrates more than one aquifer, and one or more of the aquifers may contain water which is of a quality which may degrade the other aquifer(s) penetrated if allowed to commingle, an E-Log shall be required to determine the location of the confining clay layer(s) and assist in the placement of any required annular seal(s).
5. A phone call to the **Division Hotline at (661) 862-8788** is required 48 hours before the placement of any seals or plugs.
6. Approval of water quality and final construction features is required before the water well is put into use.
7. Construction under this permit is subject to any instructions by EHD representatives.
8. Any misrepresentation or noncompliance with required permit conditions, or regulations, will result in issuance of a "Stop Work Order."
9. A copy of the Department of Water Resources Driller's Report and water quality analyses must be submitted to EHD within sixty (60) days after completion of the work.
10. "Dry" holes must be properly destroyed within two (2) weeks of drilling. A water well destruction application must be filed with EHD.
11. The permit is void one (1) year after date of issuance if work has not been started and reasonable progress toward completion made. Fees are not refundable or transferable.
12. Lead appurtenances shall not be used in construction of any private or public water supply system. The use of solders containing more than 2/10 of 1% lead is prohibited in making joints and fittings in any private or public potable water system.
13. Drilling of a water well shall be performed by a C-57 contractor licensed in accordance with the provisions of the Contractors License Law (Chapter 9, Division 3, of the Business and Professions Code) unless exempted by that act, and registered to drill within the County of Kern.
14. Permittee shall assume entire responsibility for all activities and uses under this permit and shall indemnify, defend and save the County of Kern and/or Kern County Water Agency, its officers, agents, and employees, free and harmless from any and all expense, cost or liability in connection with or resulting from the exercise of this permit, including, but not limited to, property damage, personal injury, and wrongful death.

☐ **I UNDERSTAND THAT FUTURE DEVELOPMENT PERMITS MAY NOT BE ISSUED (KCOC 17.04.120) UNLESS RECORDED LEGAL ACCESS TO THE PROPERTY CAN BE DEMONSTRATED.**

I certify that I am the owner of the above-described property, or the authorized representative of such owner, and that all the information I have furnished is current and accurate to the best of my knowledge, and I intend to construct the water well as represented above. I understand that all work is to be done in accordance with Kern County Ordinance Code Chapter 14.08, Bulletin 74-81 and all subsequent bulletins and the conditions of the Permit Application, including any conditions which may be added or changed by EHD upon review of this Application and issuance of the Permit. I further understand that any permit issued pursuant to this application is subject to such further conditions as may be deemed necessary to ensure compliance with the permit regulations.

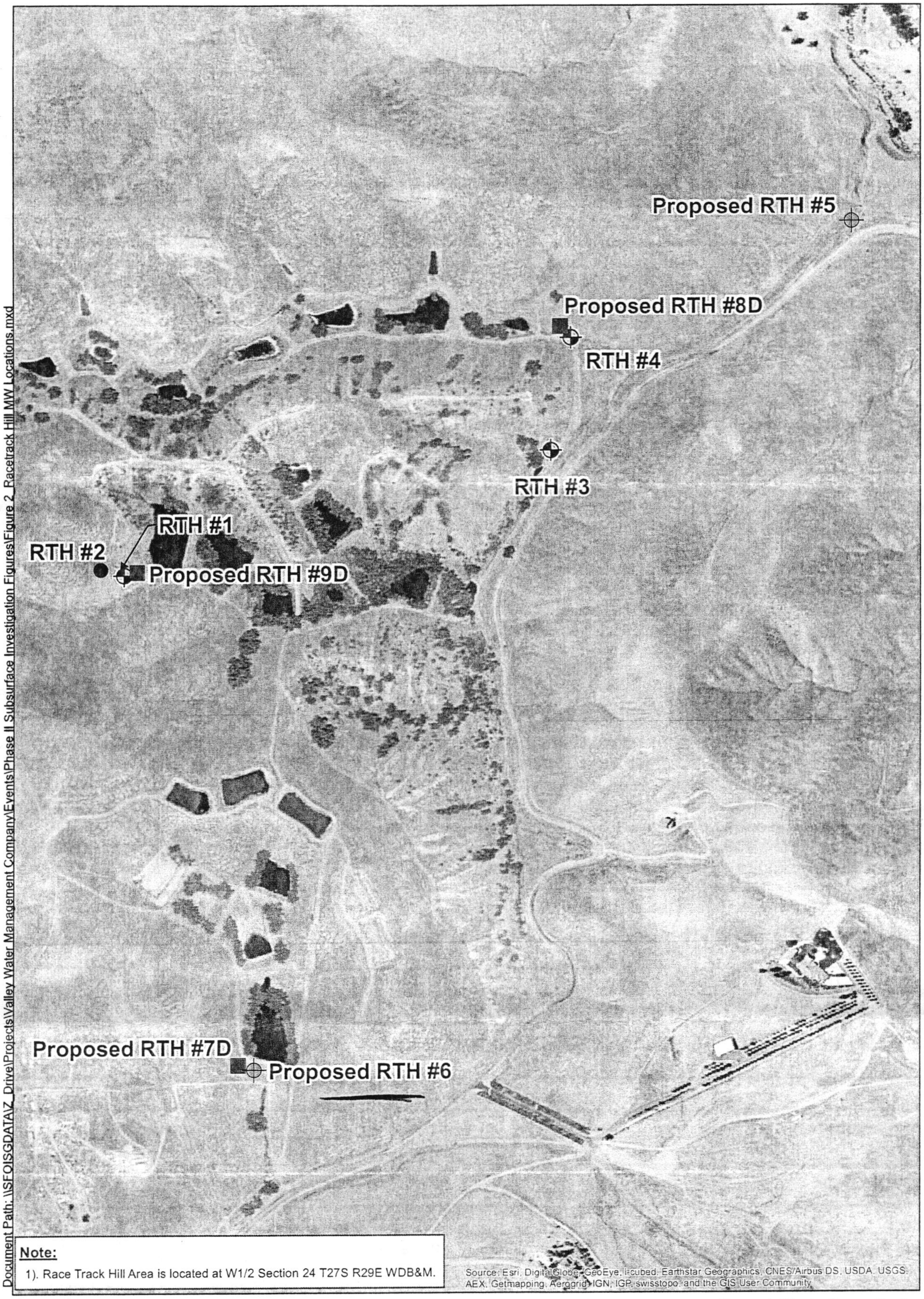
Owner or Well Driller's Signature [signature] Date 12-4-14

Authorized by [signature], Manager Date 12-4-14
Full name, title

☐ By checking this box, I consent to allowing this typewritten signature to serve as a valid substitute for a handwritten signature

For internal use only	
Permit Approved: [initials] Date: 12-9-14 Expiration Date:	Total Fee: Date Paid: Receipt #: ☐ Cash ☐ Check (#) Fee received by:
Zone: Flood Plain Approval Required: ☐ Yes ☐ No	E-Log Required: ☐ Yes ☐ No Faxed to KCWA on by

REASONS FOR DENIAL OR CONDITIONS OF PERMIT:



Legend:

- Existing Soil Boring Location
- Existing Shallow Monitoring Well Location
- Proposed Shallow Monitoring Well Location
- Proposed Deep Monitoring Well Location (to be installed by others)

N

0 200 400
Feet

Kennedy/Jenks Consultants

Valley Water Management Company
Bakersfield, California

Race Track Hill Borings and Wells

K/J 1365027*00
November 2014

Figure 2

RTH #6

KERN COUNTY
Public Health Services
DEPARTMENT

MATTHEW CONSTANTINE
DIRECTOR

2700 M STREET, SUITE 300 BAKERSFIELD, CALIFORNIA 93301-2370 VOICE 661-862-8740 FAX 661-862-8701 WWW.CO.KERN.CA.US/EH

Permit/Well #: WP 15737

Starting Date: 12/~~10~~8/2014 12-8-14

APPLICATION FOR WATER WELL PERMIT

APPLICATION MUST BE SUBMITTED AT LEAST TEN (10) WORKING DAYS PRIOR TO THE PROPOSED STARTING DATE

Mark Type of Permit: x Construct New ☐ Reconstruct/Modify ☐ Deepen ☐ Destroy

Type of Well

☐ Domestic/Private (1) ☐ Agricultural ☐ Cathodic Protection
☐ Domestic (2-4 connections) ☐ Test Hole ☐ Vadose
☐ Domestic (5 or more connections) x Monitoring ☐ Other:

MARK ONE OF THE BOXES BELOW FOR THE PARTY RESPONSIBLE FOR PAYMENT OF FEES

OWNER'S INFORMATION		PROPERTY/FACILITY INFORMATION	
Name	Valley Water Management Co.	Name	Valley Water Management Co.
Address	7500 Meany Ave. Ca	Address	~~7500 Meany Ave.~~ NO ADDRESS
City	Bakersfield State Ca Zip 93308	City	Bakersfield State Ca Zip 93308
Phone	661-410-7500 e-mail Bright@vwwater.co	APN	387-060-03 T 29S R 29E Sec 24

CONTRACTOR'S INFORMATION			
Environmental Contractor	Kennedy/Jenks Cons. Inc.	Drilling Contractor	Gregg Drilling and Testing
Address	303 Second St. Ste 300 South	Address	2726 Walnut Ave.
City	San Francisco State Ca Zip 94107	City	Signal Hill State Ca Zip 90755
Contact	Mike McLeod Phone 415-243-2150	Contact	Joanna McKeehan Phone 562-427-6899
e-mail	mikemcleod@kennedyjenks.com	e-mail	jmckeehan@greggdrilling.com

LOCATION OF WELL: VWMC Race Track Hill Facility, Edison area **TOTAL ACRES:** 338

Attach a plot plan with the exact location of water well with respect to the following items: property lines, adjoining properties, water bodies or courses, drainage pattern, roads, existing wells, structures, sewers or private disposal systems. **Include dimensions. Draw a 200' radius circle from well site location.** For **monitoring wells** provide a description of the facility to be monitored, including: location of tanks, proposed monitoring and placement, nearest street or intersection, location of any water wells or surface water within 500' radius of facility.

Provide detailed directions to site:

From the intersection of Breckinridge Road and Comanche Drive, go northeast on Breckinridge 1.54 miles.

Turn north through gate, go north 0.1 miles to base of dam to well site.

THIS APPLICATION BECOMES A PERMIT WHEN APPROVED

WELL CONSTRUCTION INFORMATION

METHOD: ☐ Reverse Rotary ☐ Rotary ☐ Air Rotary X Hollow Stem Auger ☐ Other:

WELL NAME / NUMBER	RTH#6		
MAXIMUM WELL DEPTH	150		
SEALING MATERIAL	Cement		
SEAL DEPTH (HARD ROCK/ UNCONSOLIDATED)	115		
CASING MATERIAL & GAUGE	SCH40 PVC		
CASING - INSIDE DIAMETER	4"		
SCREEN/PERFORATION DEPTH	120-150		
CONDUCTOR DEPTH	N/a		
CONDUCTOR DIAMETER	N/a		
DEPTH TO GROUNDWATER	Unk., <120		
LOCKING WELL CAP	Expanding J-plug		
BOREHOLE DIAMETER	10"		
SCREEN MATERIAL & GAUGE	SCH40 PVC		
TYPE OF BENTONITE PLUG & DEPTH	Med. Bent. Chips 115-118		
FILTER PACK MATERIAL & SIZE	Cemex #2/12		
SCREEN SLOT SIZE & LENGTH	0.010-in., 30 ft.		
SEALANT PLACEMENT METHOD	Tremie		

WELL DESTRUCTION INFORMATION

WELL NUMBER			
WELL DEPTH			
CASING MATERIAL			
SEALANT MATERIAL			
SEALANT PLACEMENT METHOD			

GENERAL CONDITIONS FOR DESTRUCTION:

1. A well destruction application must be filed with this Division if a well is being destroyed that is not in conjunction with a test hole permit.
2. Destruction procedures must be followed as per UT-50.
3. Placement of the seal must be witnessed by a representative of this Division. Forty-eight hour advanced notice is required for an appointment.

GENERAL CONDITIONS FOR ALL PERMITS:

Permit applications may be submitted to the Planning Department by county staff for zoning, access, and flood plain clearances prior to approval of the Environmental Health Division (EHD). If you are drilling within city's limits, you will have to receive approval from their Planning Department.

1. Permit applications must be submitted to EHD at least ten (10) working days prior to the proposed starting date.
2. Well site approval is required before beginning any work related to water well construction. It is unlawful to continue work past the stage at which an inspection is required unless inspection is waived or completed.
3. Other required inspections include: setting conductor casing, E-Logs, all seals, and final construction features.
4. In areas where a water well penetrates more than one aquifer, and one or more of the aquifers may contain water which is of a quality which may degrade the other aquifer(s) penetrated if allowed to commingle, an E-Log shall be required to determine the location of the confining clay layer(s) and assist in the placement of any required annular seal(s).
5. A phone call to the **Division Hotline at (661) 862-8788** is required 48 hours before the placement of any seals or plugs.
6. Approval of water quality and final construction features is required before the water well is put into use.
7. Construction under this permit is subject to any instructions by EHD representatives.
8. Any misrepresentation or noncompliance with required permit conditions, or regulations, will result in issuance of a "Stop Work Order."
9. A copy of the Department of Water Resources Driller's Report and water quality analyses must be submitted to EHD within sixty (60) days after completion of the work.
10. "Dry" holes must be properly destroyed within two (2) weeks of drilling. A water well destruction application must be filed with EHD.
11. The permit is void one (1) year after date of issuance if work has not been started and reasonable progress toward completion made. Fees are not refundable or transferable.
12. Lead appurtenances shall not be used in construction of any private or public water supply system. The use of solders containing more than 2/10 of 1% lead is prohibited in making joints and fittings in any private or public potable water system.
13. Drilling of a water well shall be performed by a C-57 contractor licensed in accordance with the provisions of the Contractors License Law (Chapter 9, Division 3, of the Business and Professions Code) unless exempted by that act, and registered to drill within the County of Kern.
14. Permittee shall assume entire responsibility for all activities and uses under this permit and shall indemnify, defend and save the County of Kern and/or Kern County Water Agency, its officers, agents, and employees, free and harmless from any and all expense, cost or liability in connection with or resulting from the exercise of this permit, including, but not limited to, property damage, personal injury, and wrongful death.

☐ **I UNDERSTAND THAT FUTURE DEVELOPMENT PERMITS MAY NOT BE ISSUED (KCOC 17.04.120) UNLESS RECORDED LEGAL ACCESS TO THE PROPERTY CAN BE DEMONSTRATED.**

I certify that I am the owner of the above-described property, or the authorized representative of such owner, and that all the information I have furnished is current and accurate to the best of my knowledge, and I intend to construct the water well as represented above. I understand that all work is to be done in accordance with Kern County Ordinance Code Chapter 14.08, Bulletin 74-81 and all subsequent bulletins and the conditions of the Permit Application, including any conditions which may be added or changed by EHD upon review of this Application and issuance of the Permit. I further understand that any permit issued pursuant to this application is subject to such further conditions as may be deemed necessary to ensure compliance with the permit regulations.

Owner or Well Driller's Signature P.L. Bright Date 11/24/14

Authorized by P.L. Bright, Manager Date 11/24/14
Full name, title

☐ By checking this box, I consent to allowing this typewritten signature to serve as a valid substitute for a handwritten signature

For internal use only	
Permit Approved: JA Date: 12-2-14 Expiration Date:	Total Fee: 750.— Date Paid: 11-25-14 Receipt #: DL 1875 ☐ Cash ☑ Check (# 1427) Fee received by: RB
Zone: Flood Plain Approval Required: N/A ☐ Yes ☐ No	E-Log Required: ☐ Yes ☐ No Faxed to KCWA on ______ by______

REASONS FOR DENIAL OR CONDITIONS OF PERMIT:

Document Path: \\SFOISGDATA\Z_Drive\Projects\Valley Water Management Company\Events\Phase II Subsurface Investigation Figures\Figure 2_Racetrack Hill MW Locations.mxd

Note:

1). Race Track Hill Area is located at W1/2 Section 24 T27S R29E WDB&M.

Legend:

- Existing Soil Boring Location
- Existing Shallow Monitoring Well Location
- Proposed Shallow Monitoring Well Location
- Proposed Deep Monitoring Well Location (to be installed by others)

N

0 200 400

Feet

Kennedy/Jenks Consultants

Valley Water Management Company
Bakersfield, California

Race Track Hill Borings and Wells

K/J 1365027*00
November 2014

Figure 2

Document Path: \\SFO\GISDATA\Z_Drive\Projects\Valley Water Management Company\Events\Phase II Subsurface Investigation Figures\Figure 1_Location Map.mxd

N

0 2,250 4,500

Feet

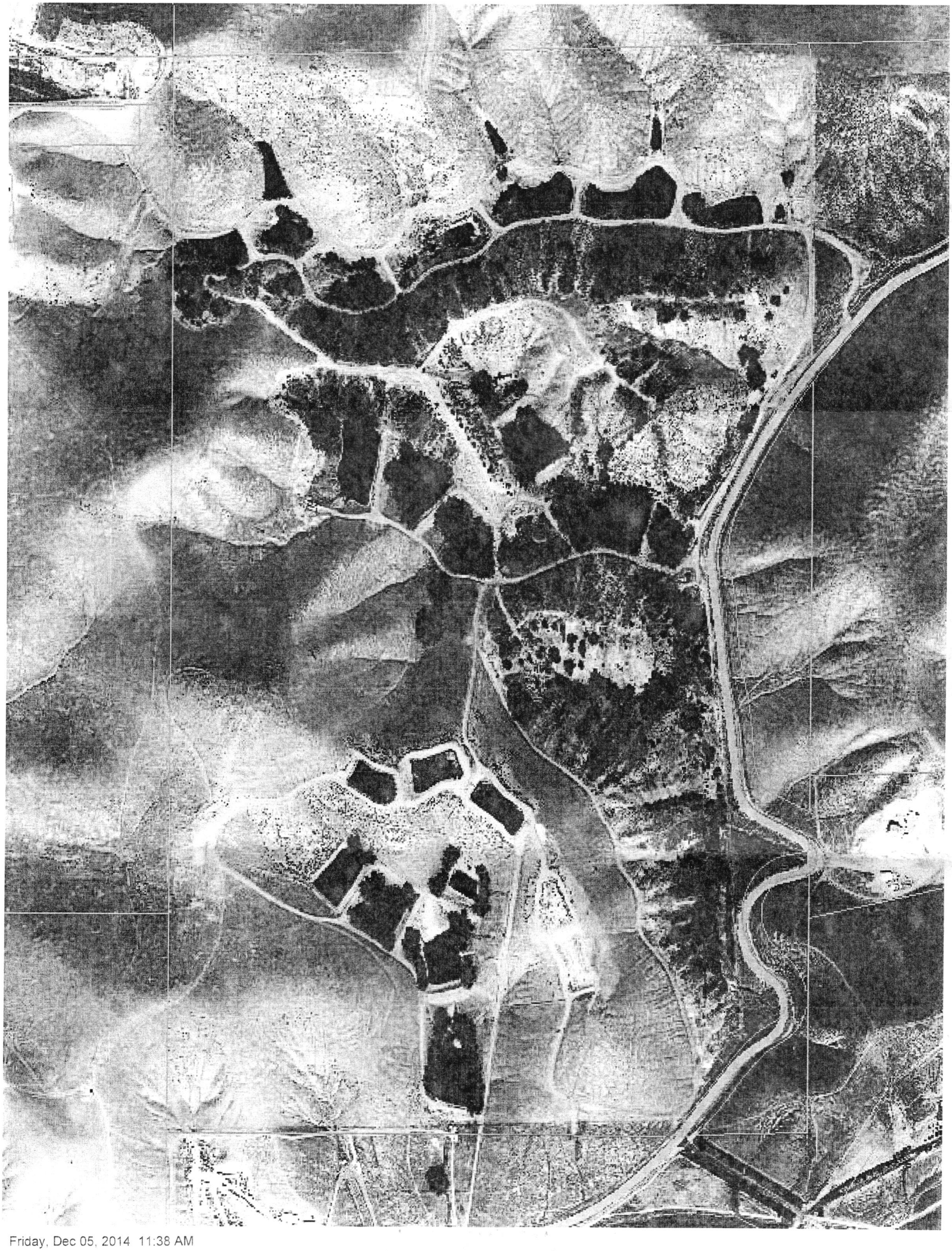
Kennedy/Jenks Consultants

Valley Water Management Company
Bakersfield, California

Site Location Map

K/J 1365027*00
November 2014

Figure 1



Friday, Dec 05, 2014 11:38 AM

2700 "M" Street
Bakersfield, CA 93301
(661) 862-8827
(661) 862-8987 Fax

COUNTY OF KERN
State of California
Resource Management Agency
Roads Department

Permit No.
1272 - 14

11/26/2014

ENCROACHMENT PERMIT

VALLEY WATER MANAGEMENT COMPANY
7500 MEANY AVE
BAKERSFIELD CA 93308

LARRY BRIGHT
(661) 410-7500 Phone
(___) ___-____ Cell
(___) ___-____ Fax

In compliance with your request of 11/25/2014 and subject to all the terms, conditions and restrictions contained below and on the reverse side hereof.

PERMISSION IS HEREBY GRANTED TO
INSTALL AND MAINTAIN SO AS NOT TO PRESENT A HAZZARD, A 4" DIAMETER GROUNDWATER MONITORING WELL WITH TRAFFIC RATED 12" DIAMETER WELL MONUMENT AND APPROPRIATE LOCATION MARKERS. THE WELL SHALL REMOVED AND CAPPED TO EXISTING REGULATIONS FOR ABANDONING A WELL.THE WELL IS AT AN APPROXIMATE DEPTH BETWEEN 10' AND 100' BELOW GROUND SURFACE, LOCATED ALONG THE NORTH SHOULDER (APPROXIMATELY 5' INSIDE OF THE COUNTY RIGHT OF WAY) OF BRECKENRIDGE ROAD APPROXIMATELY 2.8 MILES NORTH EAST OF COMANCHE DRIVE. THE WELL WILL BE NEAR THE BRECKENRIDGE ROAD CROSSING OF COTTONWOOD CREEK.

THIS PERMIT IS NOT VALID FOR THE PERFORMANCE OF ANY OTHER WORK OTHER THAN THAT WHICH THE KERN COUNTY ROADS DEPARTMENT HAS THE AUTHORITY TO GRANT. WHENEVER NECESSARY, PERMITTEE SHALL SECURE PERMISSION FROM UNDERLYING FEE PROPERTY OWNER PRIOR TO THE START OF ANY AUTHORIZED HEREUNDER. SPECIAL ATTENTION IS DIRECTED TO CONDITION 6 ON THE REVERSE SIDE OF THIS PERMIT.

SEE ATTACHED DRAWINGS FOR DETAILS.

**** YOU MUST NOTIFY THE INSPECTOR 24 HOURS PRIOR TO STARTING WORK OR YOUR PERMIT MAY BE REVOKED ****
Notify Scott Cunningham at (661) 487-2315, 24 hours prior to starting work, for inspection and prior to any backfill.

Signing shall be in accordance with Section 21401 of the Vehicle Code of the State of California, the State of California Department of Transportation's Manual of Traffic Controls (Warning Signs, Lights and Devices for Use in Performance of Work Upon Highways), and as directed by the Roads Department.
Permit not valid for work outside county maintained right-of-way.
Final Inspection Tag may be obtained upon completion.
No work to be performed under this permit on Saturday, Sunday or holidays.
This permit is to be strictly construed and no work other than that specifically mentioned above is authorized hereby.

This permit must be on the job site at all times while work is in progress.

This permit shall be void unless the work herein contemplated shall have been completed before sundown.

Sunday 05/31/2015

This permit is expressly conditioned upon the performance of the work. Failure to so perform said work in accord with specifications herein above set forth shall be deemed an immediate revocation of this permit and without notice.

KERN COUNTY ROADS DEPARTMENT

Signature on Application

By: ______________________

Signature of Permittee

YSIDRO LOPEZ

(SUBJECT TO ALL TERMS, CONDITIONS, AND RESTRICTIONS ON THE REVERSE SIDE HEREOF)

Boring & Well Construction Log

Kennedy/Jenks Consultants

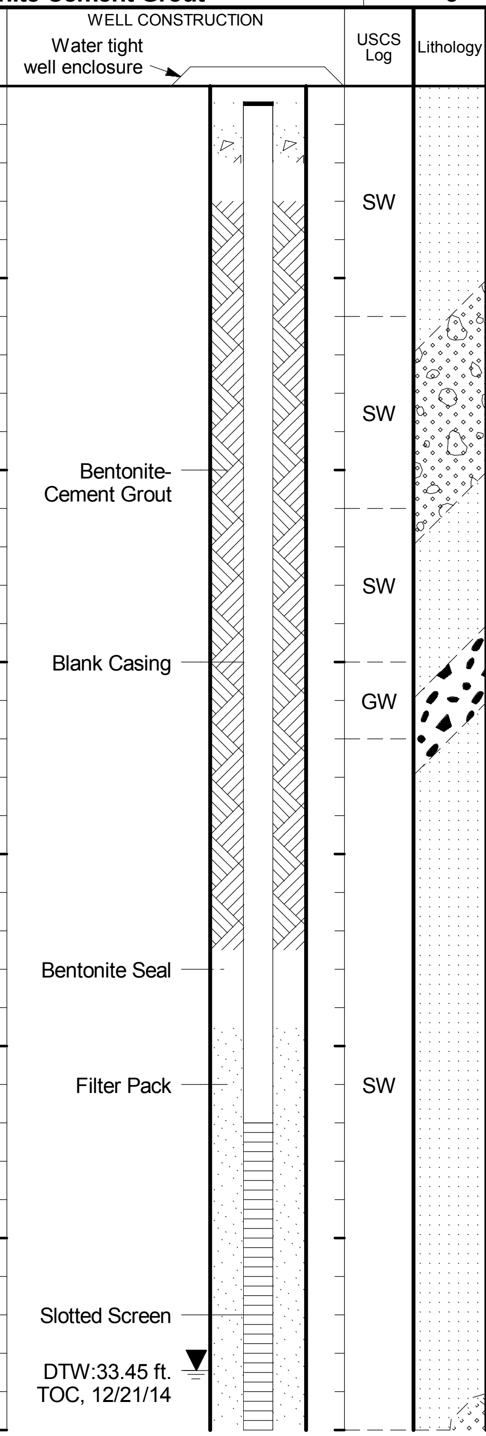
Field	Value	From	To	Unit
BORING LOCATION	Breckenridge Road			
DRILLING COMPANY	Gregg Drilling and Testing			
DRILLER	J. Sifuentes			
DRILLING METHOD(S)	Hollow Stem Auger - CME 95			
DRILL BIT(S) SIZE	Reamed with 10-in. augers			
ISOLATION CASING	n/a	n/a	n/a	FT.
BLANK CASING	4-inch SCH 40 PVC	0.5	27.0	FT.
SLOTTED CASING	4-inch SCH 40 PVC 0.010-inch slotted	27.0	57.0	FT.
SIZE AND TYPE OF FILTER PACK	Cemex #2/12	24.5	57.4	FT.
SEAL	Wyo-Ben Medium Bent. Chips	22.5	24.5	FT.
GROUT	3% Bentonite Cement Grout	3	22.5	FT.

Well Name RTH#5

Project Name Valley Water Management Co.

Project Number 1365027.00

ELEVATION AND DATUM: TOC: 810.80 ft. AMSL	TOTAL DEPTH: 57.4 ft. bgs
DATE STARTED: 12/11/14	DATE COMPLETED: 12/11/14
STATIC WATER ELEVATION: 777.35 ft. AMSL	NORTH: 2332160.899
LOGGED BY: M. McLeod	EAST: 6319525.753
SAMPLING METHODS: Continuous coring	WELL COMPLETION: ☒ SURFACE HOUSING ☐ STAND PIPE n/a FT.



SAMPLES Recovery (Feet)	Drill Depth (Feet)	USCS Log	Color	SAMPLE DESCRIPTION and DRILLING REMARKS
5	0–5	SW	10YR 7/4	**WELL GRADED SAND (SW)** VERY PALE BROWN OVERALL, <~5% GRAVEL, ~10% COARSE GRAINED SAND, ~20% MEDIUM GRAINED SAND, ~75% FINE GRAINED SAND, DRY
2	5–10	SW	10YR 6/3 10YR 8/1	**GRAVELLY WELL GRADED SAND (SW)** VERY PALE BROWN OVERALL WITH ABUNDANT WHITE, ~10-20% GRAVEL, ~20% COARSE GRAINED SAND, ~20-30% MEDIUM GRAINED SAND, ~30% FINE GRAINED SAND, VERY DENSE AND CONSOLIDATED, DRY
2	10–15	SW	10YR 6/4	**WELL GRADED SAND (SW)** LIGHT YELLOWISH BROWN, TRACE GRAVEL, <~10% COARSE GRAINED SAND, ~10-20% MEDIUM GRAINED SAND, ~70% FINE GRAINED SAND, VERY DENSE AND CONSOLIDATED, DRY
No Core	15–17	GW		**GRAVEL (GW)** 15 FT. DRILL STRING RATTLES VIOLENTLY; ABUNDANT GRAVEL IN CUTTINGS. DRILL WITHOUT SAMPLER; VERY ROCKY TO 17 FT. AND LESS ROCKY BELOW
2 (20–22); No Core (22–25); 1 (25–30); 1.5 (30–35)	17–35	SW	10YR 7/3-7/4; 10YR 6/8	**WELL GRADED SAND (SW)** VERY PALE BROWN OVERALL WITH BROWNISH YELLOW STREAKS, TRACE GRAVEL, <~10% COARSE GRAINED SAND, ~60-70% MEDIUM GRAINED SAND, ~10-20% FINE GRAINED SAND, VERY DENSE AND CONSOLIDATED, DRY, SUBHORIZONTAL BROWNISH YELLOW STREAKING GRAVEL INCREASES TO ~10-20%, UP TO 2.5-INCHES DIAMETER

BORING & WELL CONSTRUCTION 1365027.00.GPJ KENNEDY JENKS.GDT 4/3/15

F-40.1
(6-87) (3-88) (8-90)

Project Name Valley Water Management Co. **Project Number** 1365027.00 **Well Name** RTH#5

Samples: Type & No.	Samples: Recovery (Feet)	Samples: Penetr. Resist. Blows/6"	Drill Depth (Feet)	Well Construction	USCS Log	Lithology	Color	Sample Description and Drilling Remarks
	2			First Encountered Water				**GRAVELLY WELL GRADED SAND (SW)** YELLOW OVERALL WITH BROWNISH YELLOW STREAKS, ~20% GRAVEL TO 2-INCHES, ~10%-20% COARSE GRAINED SAND, ~70% FINE GRAINED SAND, VERY DENSE, MOIST, ABUNDANT COARSE FELDSPAR AND QUARTZ
	No Core							
	1		40				10YR 7/6 10YR 6/8	41 FT. MATERIAL IS WET. WATER LEVEL MEASURED AT APPX. 37 FT. MATERIAL IS DENSE AND GRAVELLY-CANNOT PENETRATE WITH SAMPLE BARREL SO START ALTERNATING CORING/NON CORING RUNS
	No Core							
	No Core		45	Filter Pack	SW			
	1.5		50	Slotted Screen				50 FT. COLOR CHANGES TO BROWNISH YELLOW
	No Core						10YR 6/8	
	No Core		55					57 FT. AUGER REFUSAL

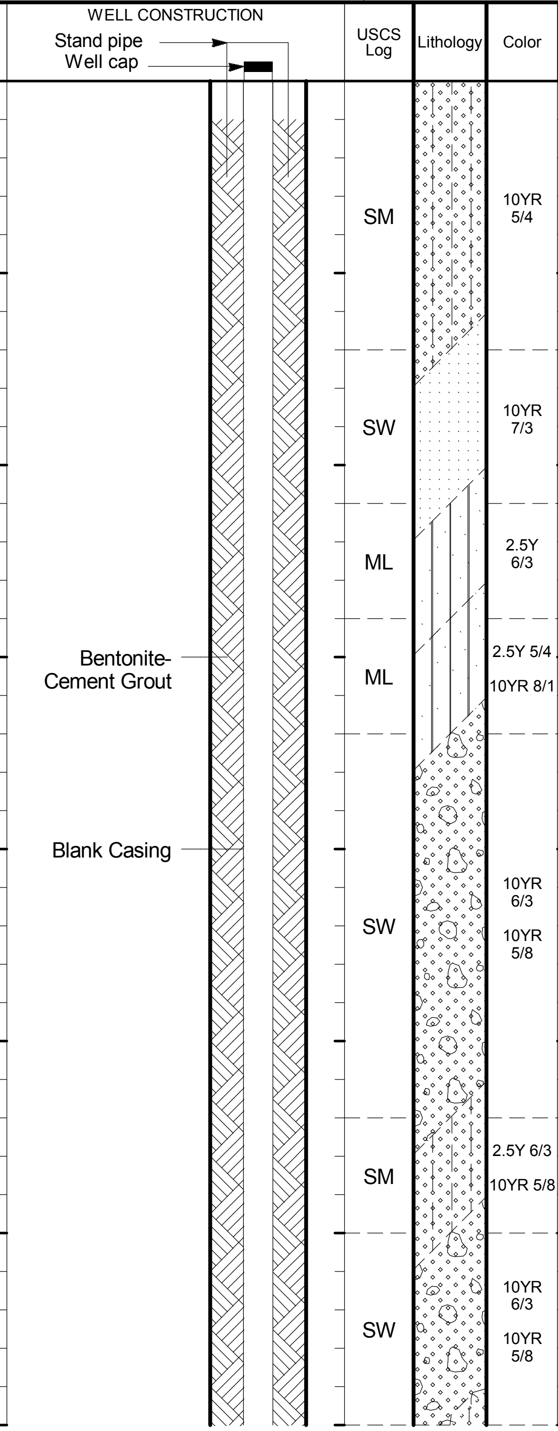
NOTES

1. ALL CONTACTS APPROXIMATE
2. BGS: BELOW GROUND SURFACE
3. COLOR DESIGNATION IN ACCORDANCE WITH THE MUNSELL SOIL COLOR CHARTS (KOLLMORGEN INSTRUMENTS CORPORATION, 1990)
4. SOIL CLASSIFIED IN ACCORDANCE WITH THE UNIFIED SOIL CLASSIFICATION SYSTEM, ASTM D-2488-93

Boring & Well Construction Log

Kennedy/Jenks Consultants

BORING LOCATION: Race Track Hill			Well Name: RTH#6
DRILLING COMPANY: Gregg Drilling and Testing	DRILLER: J. Sifuentes		Project Name: Valley Water Management Co.
DRILLING METHOD(S): Hollow Stem Auger - CME 95	DRILL BIT(S) SIZE: Reamed with 10-in. augers		Project Number: 1365027.00
ISOLATION CASING: n/a	FROM n/a	TO n/a FT.	ELEVATION AND DATUM: TOC: 1059.82 ft. AMSL / TOTAL DEPTH: 145.0 ft. bgs
BLANK CASING: 4-inch SCH 40 PVC	FROM +2.1	TO 113.5 FT.	DATE STARTED: 12/8/14 / DATE COMPLETED: 12/10/14
SLOTTED CASING: 4-inch SCH 40 PVC 0.010-inch slotted	FROM 113.5	TO 143.5 FT.	STATIC WATER ELEVATION: 939.51 ft. AMSL / NORTH: 2328430.428
SIZE AND TYPE OF FILTER PACK: Cemex #2/12	FROM 111.0	TO 145.0 FT.	LOGGED BY: M. McLeod / EAST: 6316629.347
SEAL: Wyo-Ben Medium Bent. Chips	FROM 107.8	TO 111.0 FT.	SAMPLING METHODS: Continuous coring
GROUT: 3% Bentonite Cement Grout	FROM 1	TO 107.8 FT.	WELL COMPLETION: ☐ SURFACE HOUSING ☒ STAND PIPE 3 FT.



SAMPLES Recovery (Feet)	Drill Depth (Feet)	USCS Log	Color	SAMPLE DESCRIPTION and DRILLING REMARKS
5	0–5	SM	10YR 5/4	**SILTY SAND (SM)** YELLOWISH BROWN, TRACE COARSE GRAINED SAND, ~10-20% MEDIUM GRAINED SAND, ~60-70% FINE GRAINED SAND, ~10% NON-PLASTIC FINES, DRY
4	5–10	SW	10YR 7/3	**WELL GRADED SAND (SW)** VERY PALE BROWN OVERALL, ~10-20% COARSE GRAINED SAND, ~20% MEDIUM GRAINED SAND, ~70% FINE GRAINED SAND, VERY DENSE AND CONSOLIDATED
5	10–15	ML	2.5Y 6/3	**SANDY SILT (ML)** LIGHT YELLOWISH BROWN OVERALL, ~20-30% FINE GRAINED SAND, ~70% NON-PLASTIC FINES, CEMENTED, BRITTLE, AND FRIABLE; BREAKS INTO SUBHORIZONTAL CHIPS
	15	ML	2.5Y 5/4 10YR 8/1	**SANDY SILT (ML)** LIGHT OLIVE BROWN AND WHITE, ~40% COARSE GRAINED SAND TO MEDIUM GRAINED SAND WHITE FELDSPAR AND QUARTZ; ~60% LIGHT OLIVE BROWN SILT MATRIX, VERY STIFF, NO PLASTICITY, DRY
4	15–20	SW	10YR 6/3 10YR 5/8	**WELL GRADED SAND WITH GRAVEL (SW)** PALE BROWN OVERALL WITH YELLOWISH BROWN STREAKS, ~20% GRAVEL, ~20% COARSE GRAINED SAND (MAINLY WHITE FELDSPAR), ~30% MEDIUM GRAINED SAND (INC. SOME MICAS), ~30% FINE GRAINED SAND, VERY DENSE AND CONSOLIDATED
5	20–25			23 FT. SOME SUBHORIZONTAL COLOR BANDING
4	25–30	SM	2.5Y 6/3 10YR 5/8	**SILTY SAND (SM)** LIGHT YELLOWISH BROWN AND YELLOWISH BROWN BANDING, ~80% FINE GRAINED SAND INC. MICAS, ~20% NON-PLASTIC FINES, DRY
4.5	30–35	SW	10YR 6/3 10YR 5/8	**WELL GRADED SAND WITH GRAVEL (SW)** PALE BROWN OVERALL WITH YELLOWISH BROWN STREAKS, ~20% GRAVEL, ~20% COARSE GRAINED SAND (MAINLY WHITE FELDSPAR), ~30% MEDIUM GRAINED SAND (INC. SOME MICAS), ~30% FINE GRAINED SAND, VERY DENSE AND CONSOLIDATED

Project Name Valley Water Management Co. **Project Number** 1365027.00 **Well Name** RTH#6

Recovery (Feet)	Drill Depth (Feet)	Well Construction	USCS Log	Color	Sample Description and Drilling Remarks
4			SM	2.5Y 6/3	**SILTY SAND (SM)** LIGHT YELLOWISH BROWN AND WHITE, ~15% WHITE MEDIUM GRAINED SAND FELDSPAR, ~70% LIGHT YELLOWISH BROWN FINE GRAINED SAND, ~15% NON-PLASTIC FINES, MOIST?
5	40		SW	10YR 6/3, 10YR 5/8	**WELL GRADED SAND WITH GRAVEL (SW)** PALE BROWN OVERALL WITH YELLOWISH BROWN STREAKS, ~20% GRAVEL, ~20% COARSE GRAINED SAND (MAINLY WHITE FELDSPAR), ~30% MEDIUM GRAINED SAND (INC. SOME MICAS), ~30% FINE GRAINED SAND, VERY DENSE AND CONSOLIDATED
			SM	2.5Y 6/3	**SILTY SAND OR SILTY SAND WITH CLAY (SM)** LIGHT YELLOWISH BROWN OVERALL, ~80% FINE GRAINED SAND INC. MICA, ~20% SILT AND SOME CLAY, VERY STIFF/DENSE, NO TO LOW PLASTICITY
5	45		SM	2.5Y 5/3	**SILTY SAND (SM)** LIGHT OLIVE BROWN AND WHITE, ~80% FINE GRAINED SAND INC. MICA, ~20% NON-PLASTIC FINES, BRITTLE AND BREAKS INTO SUBHORIZONTAL CHIPS
			ML	2.5Y 6/3	**SANDY SILT (ML)** LIGHT YELLOWISH BROWN OVERALL, ~10% SCATTERED WHITE MEDIUM GRAINED SAND, ~20-30% SCATTERED FINE GRAINED SAND, ~60% NON-PLASTIC FINES AND POSS. CLAY, VERY STIFF, NO PLASTICITY, DRY
4.5	50		ML	2.5Y 5/3, 2.5Y6/8	**SILT TO SANDY SILT (ML)** LIGHT OLIVE BROWN OVERALL, ~5-10% FINE GRAINED SAND, ~80-90% SILT, VERY STIFF AND BRITTLE 52 FT. - 54 FT. COLOR INCLUDES OLIVE YELLOW
	55	Bentonite-Cement Grout	ML	2.5Y 6/3	**SANDY SILT (ML)** LIGHT YELLOWISH BROWN OVERALL, ~10-20% SCATTERED WHITE AND BLACK MEDIUM GRAINED SAND, ~80% NON-PLASTIC FINES, VERY STIFF, NO PLASTICITY
4.5			SM	2.5Y 6/2, 2.5Y 7/2	**SILTY SAND (SM)** LIGHT BROWNISH GRAY TO LIGHT BROWN, ~60% FINE GRAINED SAND INC. MICAS, ~40-20% NON-PLASTIC FINES, MOIST TO DRY
	60	Blank Casing	SW	2.5Y 6/2	**WELL GRADED SAND (SW)** LIGHT BROWNISH GRAY OVERALL, ~20% COARSE GRAINED SAND, ~40% MEDIUM GRAINED SAND, ~40% FINE GRAINED SAND, VERY DENSE, DRY
4			SM	2.5Y 5/3	**SILTY SAND (SM)** LIGHT OLIVE BROWN AND WHITE, ~40% WHITE COARSE GRAINED SAND - MEDIUM GRAINED SAND FELSPAR AND QUARTZ; ~60% LIGHT OLIVE BROWN FINE GRAINED SAND AND NON-PLASTIC FINES
3.5	65				**WELL GRADED SAND WITH GRAVEL (SW)** LIGHT GRAY WITH OLIVE YELLOW STAINS AND BLACK AND WHITE GRAINS, ~10% GRAVEL, ~20% COARSE GRAINED SAND, ~60% MEDIUM GRAINED SAND, ~10-20% FINE GRAINED SAND, VERY DENSE AND CONSOLIDATED
3.5	70		SW	2.5Y 7/2, 2.5Y 5/8, 10YR 8/1	
5	75		SM	2.5Y 6/3, 2.5Y 6/8	**SILTY SAND (SM)** LIGHT YELLOWISH BROWN OVERALL WITH SOME SUBHORIZONTAL BANDING AND OLIVE YELLOW STAINING, ~80-90% FINE GRAINED SAND, ~10-20% NON-PLASTIC FINES
	80		SM	2.5Y 5/3	**SILTY SAND (SM)** LIGHT OLIVE BROWN AND WHITE,

BORING & WELL CONSTRUCTION 1365027.00.GPJ KENNEDY JENKS.GDT 6/15/15

Boring & Well Construction Log

Kennedy/Jenks Consultants

Project Name Valley Water Management Co. **Project Number** 1365027.00 **Well Name** RTH#6

Depth (Feet)	Recovery (Feet)	Well Construction	USCS Log	Color	Sample Description and Drilling Remarks
					~40% WHITE COARSE GRAINED SAND - MEDIUM GRAINED SAND FELDSPAR AND QUARTZ; ~60% LIGHT OLIVE BROWN FINE GRAINED SAND AND NON-PLASTIC FINES
85	4		SW	2.5Y 7/2; 2.5Y 5/8; 10YR 8/1	**WELL GRADED SAND WITH GRAVEL (SW)** LIGHT GRAY WITH OLIVE YELLOW STAINS AND BLACK AND WHITE GRAINS, ~10% GRAVEL, ~20% COARSE GRAINED SAND, ~60% MEDIUM GRAINED SAND, ~10-20% FINE GRAINED SAND, VERY DENSE AND CONSOLIDATED
	3		SM	2.5Y 5/2	**SILTY SAND (SM)** GRAYISH BROWN AND WHITE, ~20% WHITE COARSE GRAINED SAND - MEDIUM GRAINED SAND FELDSPAR AND QUARTZ; ~40-60% GRAYISH BROWN FINE GRAINED SAND AND ~40% GRAYISH BROWN NON-PLASTIC FINES
90	4	Bentonite-Cement Grout	SW	2.5Y 7/2; 10YR 8/1	**WELL GRADED SAND WITH GRAVEL (SW)** LIGHT GRAY WITH BLACK AND WHITE GRAINS, ~10% GRAVEL, ~20% COARSE GRAINED SAND, ~60% MEDIUM GRAINED SAND, ~10-20% FINE GRAINED SAND, VERY DENSE AND CONSOLIDATED
95	4.5	Blank Casing			
100	4		SM	2.5Y 5/2	**SILTY SAND (SM)** GRAYISH BROWN OVERALL, TRACE COARSE GRAINED SAND, ~10-20% MEDIUM GRAINED SAND, ~70% FINE GRAINED SAND, ~20% NON-PLASTIC FINES, VERY DENSE, DRY
105	4		SW	2.5Y 7/2; 10YR 8/1	**WELL GRADED SAND WITH GRAVEL (SW)** LIGHT GRAY WITH BLACK AND WHITE GRAINS, <10% GRAVEL, ~20% COARSE GRAINED SAND, ~60% MEDIUM GRAINED SAND, ~10-20% FINE GRAINED SAND, VERY DENSE AND CONSOLIDATED
110	3	Bentonite Seal; Filter Pack			
115	3	Slotted Screen	SW	2.5Y 6/2	**WELL GRADED SAND WITH SILT (SW)** LIGHT BROWNISH GRAY OVERALL, TRACE GRAVEL, TRACE COARSE GRAINED SAND, ~10-20 MEDIUM GRAINED SAND, ~70% FINE GRAINED SAND, ~10% NON-PLASTIC FINES, VERY DENSE, DRY
120	1	DTW: 120.31 ft. TOC, 12/22/14; First Encountered Water	SW	2.5Y 7/2; 10YR 8/1	**WELL GRADED SAND WITH GRAVEL (SW)** LIGHT GRAY WITH BLACK AND WHITE GRAINS, ~10% GRAVEL, ~20% COARSE GRAINED SAND, ~60% MEDIUM GRAINED SAND, ~10-20% FINE GRAINED SAND, VERY DENSE AND CONSOLIDATED 120-125 FT. DRILL WITHOUT SAMPLING DUE TO DENSITY AND GRAVEL BLOCKAGE 125 FT. AFTER LUNCH BREAK SOUND WATER LEVEL AT 123 FT. BGS
125					

BORING & WELL CONSTRUCTION 1365027.00.GPJ KENNEDY JENKS.GDT 6/15/15

F-40.1
(6-87) (3-88) (8-90)

Project Name Valley Water Management Co. **Project Number** 1365027.00 **Well Name** RTH#6

SAMPLES Type & No.	Recovery (Feet)	Penetr. Resist. Blows/6"	Drill Depth (Feet)	WELL CONSTRUCTION	USCS Log	Lithology	Color	SAMPLE DESCRIPTION and DRILLING REMARKS
								WELL GRADED SAND WITH GRAVEL CONT'D
	3							125-130 FT. SAMPLER BARREL IS WET
			130					
	3						2.5Y 7/2 10YR 8/1	
	No core		135	Filter Pack	SW			135-140 FT. DRILL WITHOUT SAMPLING DUE TO DENSITY AND GRAVEL BLOCKAGE
	3		140	Slotted Screen			2.5Y 6/2 10YR 8/1	140 FT. COLOR CHANGES TO LIGHT BROWNISH GRAY WITH WHITE AND BLACK GRAINS
			145					

NOTES
1. ALL CONTACTS APPROXIMATE
2. BGS: BELOW GROUND SURFACE
3. COLOR DESIGNATION IN ACCORDANCE WITH THE MUNSELL SOIL COLOR CHARTS (KOLLMORGEN INSTRUMENTS CORPORATION, 1990)
4. SOIL CLASSIFIED IN ACCORDANCE WITH THE UNIFIED SOIL CLASSIFICATION SYSTEM, ASTM D-2488-93

BORING & WELL CONSTRUCTION 1365027.00.GPJ KENNEDY JENKS.GDT 6/15/15

Appendix B-2

Monitoring Well Development Logs

GREGG

MONITORING WELL DEVELOPMENT LOG

All measurements taken from: ☑ Top of Casing ☐ Protective Casing ☐ Ground Level

Sample ID ______

Qty. of Drilling Fluid Lost ______

Well Number: RTH #6

Date: DECEMBER 15-14

Time Start: ______

Client: KENNEDY JENKS

Project: RACE TRACK Hill Site

Job Number: ______

Installation Date: ______

Well Diameter: 4" SCH40.

Borehole Diameter: ______

Screen Length: ______

Measured Depth (pre-development): 143.46

Measured Depth (post-development): 146.41

Static Water Level (ft.): 120.16

Standing Water Column (ft.): 26.25

One Well Volume (gal.): 17.0

One Annulus Vol. (gal.): ______

Minimum Gal. to be Purged: 170.62

Development Method: BAIL-SWAB-BAIL PUMP.

Purging Equipment: 2" GRUNDFOS

Water Level Equipment: KECK.

pH/EC Meter: HORIBA U-10.

Turbidity Meter: "

Other: ——

Field Parameters Measured

Time	Amount Purged (gal)	EC MS/CM	pH	Temp. °C	Turbidity NTU	D.O.	SAL. %	GPM / W.L.	Comments	Field Tech.
									Bail Surge	
255	175	4.92	7.14	24.0	999	6.16	0.24	/127	twice, well is very	
3:05	195	4.29	7.13	23.6	999	6.33	0.21	2.0/137	Sensitive, Color Grey	
3.10	215	5.14	7.29	24.3	999	5.12	0.26	1.0/ Pump intake	of water	
3 20	225	5.03	7.23	24.4	810	5.38	0.26	1.0/ "		
335	232	4.74	7.21	24.9	310	5.82	0.25	0.5/"		
345	238	4.72	7.20	24.9	175	5.77	0.24	"/"		
355	243	4.68	7.19	25.0	55	5.73	0.24	"/"		
405	248	4.68	7.20	25.1	15	5.71	0.24	"/"		
415	254	4.68	7.19	25.2	5	5.73	0.24	"/"		

Final Field Parameter Measurements

Time	Amount Purged (gal)	EC MS/CM	pH	Temp. °C	Turbidity NTU	D.O.	SAL. %	GPM / W.L.	Comments	Field Tech.
4:30	259	4.68	7.19	25.2	4	5.70	0.24	"/"		

MONITORING WELL DEVELOPMENT LOG

GREGG

All measurements taken from: ☑ Top of Casing ☐ Protective Casing ☐ Ground Level

Sample ID ______

Qty. of Drilling Fluid Lost ______

Well Number RTH #5

Borehole Diameter ______

Minimum Gal. to be Purged 151.12

Date DECEMBER 16-2014

Screen Length ______

Development Method BAIL-SWAB BAIL-PUMP

Time Start: 645

Measured Depth (pre-development) 56.1

Client KENNEDY JENKS

Measured Depth (post-development) 56.63

Purging Equipment 2" REDYFLOW 2

Project RACE TRACK Hill Site

Static Water Level (ft.) 33.38

Water Level Equipment KECK

Job Number ——

Standing Water Column (ft.) 23.25

pH/EC Meter HORIBA U-10.

Installation Date ______

One Well Volume (gal.) 15.11

Turbidity Meter HORIBA U-10

Well Diameter 4"

One Annulus Vol. (gal.) ______

Other ______

Field Parameters Measured

Time	Amount Purged (gal)	EC MS/CM	pH	Temp. °C	Turbidity NTU	D.O. Mg/L	SAL. %	GPM / W.L.	Comments	Field Tech.
									BAil well	
10:10	150	.613	7.00	24.6	999	6.14	0.02	4.5/54.3	Twice, Surge	D.A.
1022	200	.590	7.01	24.6	999	6.05	0.02	3.0/50.3	twice, Bail	
1038	250	.587	7.00	24.6	63	6.06	0.02	3/47.6	Pump.	
1054	300	.585	7.01	24.6	21	6.02	0.02	3/47.65		
1110	350	.584	7.01	24.6	4	6.04	0.02	3/47.75		
1127	400	.584	7.02	24.6	4	6.07	0.02	3/47.65		
1136	427	.584	7.03	24.6	4	6.07	0.02	3/47.65		

Final Field Parameter Measurements

Appendix B-3

Survey Report

VALLEY WATER MANAGEMENT
GROUNDWATER MONITORING WELLS
RACETRACK HILL
SECTION 24 29/29

WELL	ELEV	DESC	DATUM	NORTHING	EASTING
RTH#5	810.80	TOP PVC CASING	NAD83	2332160.8990	6319525.7530
	811.30	TOP MON RIM			
RTH#6	1059.82	TOP PVC CASING	NAD83	2328430.4280	6316629.3470
	1057.71	TOP WELL PAD			

BENCHMARK:

NGS MONUMENT BRASS CAP - PID "FU0159"

1991 ELEV = 785.40

HORIZONTAL DATUM NAD83, ZONE 5

PREPARED BY:
DEE JASPAR & ASSOCIATES, INC.

DATE OF SURVEY:
December 22, 2014

GLOBAL_ID	FIELD_PT_NAME	FIELD_PT_CLASS	XY_SURVEY_DATE	LATITUDE	LONGITUDE	XY_METHOD	XY_DATUM	XY_ACC_VAL	XY_SURVEY_ORG	GPS_EQUIP_TYPE	XY_SURVEY_DESC	EFFECTIVE_DATE
	RTH#5	MW	12/22/2013	35.23526153	-118.4844484	CGPS	NAD83	20	DEE JASPAR RCE, PE23042	EP25	SPECTRA PRECISION EPOCH 35	
	RTH#6	MW	12/22/2013	35.23157424	-118.4919455	CGPS	NAD83	20	DEE JASPAR RCE, PE23042	EP25	SPECTRA PRECISION EPOCH 35	

GLOBAL_ID	FIELD_PT_NAME	ELEV_SURVEY_DATE	ELEVATION	ELEV_METHOD	ELEV_DATUM	ELEV_ACC_VAL	ELEV_SURVEY_ORG	RISER_HT	ELEV_DESC	EFFECTIVE_DATE
	RTH#5	12/22/2013	810.80	CGPS	88	3	DEE JASPAR RCE, PE23042		NGS BRASS CAP PID "FU0159" 1991 ELEV=785.4	
	RTH#6	12/22/2013	1059.82	CGPS	88	3	DEE JASPAR RCE, PE23042	2.11	NGS BRASS CAP PID "FU0159" 1991 ELEV=785.4	

Appendix B-4

Monitoring Well Purge Forms

Well Monitoring Data Sheet

Project # 1365027 * 00	Client: Valley Water Management
Sampler R Pirie	Start Date: 12/22/14
Well I.D. RTH # 6	Well Diameter 2 3 4 6 8 Other:
Total Well Depth:	Depth to Water: Pre: 120.31 Post: 127.76 120.42 @ Sampling
Depth to Free Product:	thickness of Free Product: (feet):
Reference to: PVC Grade	Flow Cell Type:

Purge Method: 2"Grundfos Pump Peristalitic Pump Bladder Pump Other:

Sample Method: Dedicated Tubing New Tubing Disposable Bailers Other:

Flow Rate: Pump Depth:

Well Volume Calculation (Fill in Before Purging)	Total Depth (ft)	-	Depth to Water (ft)	=	Water Column (ft)	Multiplier for Casing Diameter (in) 2	4	6	=	44.52 Casing Volume (gal)
	143.5		120.31		23.19	0.16	0.64	1.44		14.84

1405 Time	Temp (°C or °F)	pH	Cond. (mS or uS)	Turbiditiy (NTUs)	D.O. ((mg/l)	ORP (mV)	Water Removed (gals. or mL)	Observations
1410	22.96	7.10	5337	12.6	7.10	77.0	2.5	W/L 121.8
1415	23.93	7.07	5368	13.6	6.87	61.1	4.5	121.95
1428	24.68	7.03	5336	20.7	6.55	45.7	9.0	122.63
1438	24.85	7.01	5387	34.6	6.31	42.8	14.0	123.20
1448	25.33	7.04	5408	33.2	6.04	40.0	19.0	123.60
1458	25.48	6.99	5375	26.1	5.90	40.3	24.0	123.88
1508	24.94	6.97	5116	79.2	6.31	40.0	29.0	124.29
1516	23.85	6.95	5109	91.6	6.32	40.9	34.0	126.20
1526	23.64	6.95	5068	87.7	6.31	41.0	39.0	127.15
1536	23.43	6.91	4988	107.7	6.39	41.7	44.0	127.76

Did well dewater? Yes No Amount actually evacuated:

Sampling Time: 0830 Sampling Date: 12/23/14

Sample I.D.: RTH # 6 - 122314 Laboratory: BC Labs

Analyzed for TPHg BTEX MTBE TPHd OTHER:

Equipment Blank I.D.: @ Time Duplicate I.D.:

Well Monitoring Data Sheet

Project #	RTH #5 136597*00	Client:	Valley Water Management
Sampler	R Plinia	Start Date:	12/21/14
Well I.D.	RTH #5	Well Diameter	2 3 4 6 8 Other:
Total Well Depth:		Depth to Water: Pre:	33.45 Post: 35.92
Depth to Free Product:		thickness of Free Product: (feet):	
Reference to:	PVC Grade	Flow Cell Type:	YSI 6920

Purge Method: 2"Grundfos Pump Peristalitic Pump Bladder Pump Other:

Sample Method: Dedicated Tubing New Tubing Disposable Bailers Other:

Flow Rate: Pump Depth:

Well Volume Calculation (Fill in Before Purging)	Total Depth (ft)	-	Depth to Water (ft)	=	Water Column (ft)	Multiplier for Casing Diameter (in) 2 / 4 / 6	=	Casing Volume (gal)
	56.42		33.45		22.97	0.16 / 0.64 / 1.44		14.70 (44.10)

Time (1350)	Temp (°C or °F)	pH	Cond. (mS or uS)	Turbiditiy (NTUs)	D.O. ((mg/l)	ORP (mV)	Water Removed (gals. or mL)	Observations
1355	24.31	7.39	670	5.7	2.21	72.5	2.5	WL 34.28
1405	24.48	7.42	673	39.2	2.14	51.4	7.5	
1410	24.12	7.39	661	3.7	2.05	44.7	12.5	35.67
1415	24.17	7.37	655	11.2	1.97	39.0	22.5	35.95
1420	24.18	7.36	653	3.5	1.96	38.3	32.5	36.02
1427	24.16	7.34	660	2.6	1.99	36.8	44.5	35.92

Did well dewater? Yes No Amount actually evacuated:

Sampling Time: 1430 Sampling Date: 12/21/14

Sample I.D.: RTH#5-122114 Laboratory: BC Labs

Analyzed for TPHg BTEX MTBE TPHd OTHER:

Equipment Blank I.D.: @ Time Duplicate I.D.:

Well Monitoring Data Sheet

Project # 1365027*00	Client: Valley Water Management
Sampler R Pinna	Start Date: 12/22/14
Well I.D. RTH #4	Well Diameter 2 3 4 6 8 Other:
Total Well Depth:	Depth to Water: Pre: 84.41 Post: 91.65 8750 @ Sampling
Depth to Free Product:	thickness of Free Product: (feet):
Reference to: PVC Grade	Flow Cell Type: YSI 6920

Purge Method: 2" Grundfos Pump Peristalitic Pump Bladder Pump Other:

Sample Method: Dedicated Tubing New Tubing Disposable Bailers Other:

Flow Rate: Pump Depth:

232

Well Volume Calculation (Fill in Before Purging)	Total Depth (ft)	-	Depth to Water (ft)	=	Water Column (ft)	Multiplier for Casing Diameter (in) 2	4	6	=	Casing Volume (gal) 29.77
	99.92		84.41		15.51	0.16	0.64	1.44		9.92

0750 Time	Temp (°C or °F)	pH	Cond. (mS or uS)	Turbiditiy (NTUs)	D.O. ((mg/l)	ORP (mV)	Water Removed (gals. or mL)	Observations
0800	23.59	7.08	6340	57.7	0.58	41.0	5.0	88.15
0810	23.20	7.04	6318	55.2	1.02	54.1	10.0	89.45
0820	23.24	7.03	6328	90.5	1.22	32.2	15.0	90.71
0830	23.33	7.01	6400	106.8	1.42	32.6	20.0	91.23
0840	23.40	7.01	6494	83.4	1.78	34.6	25.0	91.53
0850	23.49	6.98	6515	64.2	1.84	36.0	30.0	91.65

Did well dewater? Yes No	Amount actually evacuated:
Sampling Time: 0905	Sampling Date: 12/22/14
Sample I.D.: RTH #4	Laboratory: BC Labs
Analyzed for TPHg BTEX	MTBE TPHd OTHER:
Equipment Blank I.D.: @ Time	Duplicate I.D.:

Well Monitoring Data Sheet

Project #	1365027*00	Client:	Valley Water Management
Sampler	R. Prince	Start Date:	12/22/14
Well I.D.	RTH#3	Well Diameter	2 3 4 6 8 Other:
Total Well Depth:	104.50	Depth to Water: Pre: 87.31	Post: 87.41 @ Sampling
Depth to Free Product:		thickness of Free Product: (feet):	
Reference to:	PVC Grade	Flow Cell Type:	YSI 6920

Purge Method: 2"Grundfos Pump Peristalitic Pump Bladder Pump Other:

Sample Method: Dedicated Tubing ~~New Tubing~~ Disposable Bailers Other:

Flow Rate: Pump Depth:

Well Volume Calculation (Fill in Before Purging)	Total Depth (ft)	-	Depth to Water (ft)	=	Water Column (ft)	Multiplier for Casing Diameter (in) 2 / 4 / 6	=	Casing Volume (gal)
	104.50				17.19	0.16 / 0.64 / 1.44		11.00 / 33.00

1030 Time	Temp (°C or °F)	pH	Cond. (mS or uS)	Turbiditiy (NTUs)	D.O. (mg/l)	ORP (mV)	Water Removed (gals. or mL)	Observations
1035	22.97	6.32	1997	131.4	0.65	5.6	5.0	W/L 91.00
1045	23.30	6.35	1908	144.4	0.45	4.9	15.0	94.28
1055	23.60	6.47	1557	15.3	0.39	2.2	25.0	97.65
1205	23.92	6.37	1878	10.9	0.47	3.7	33.00	99.80

Did well dewater? Yes No Amount actually evacuated:

Sampling Time: 1000 Sampling Date: 12/23/14

Sample I.D.: RTH#3-121423 Laboratory: BC Labs

Analyzed for TPHg BTEX MTBE TPHd OTHER:

Equipment Blank I.D.: @ Time Duplicate I.D.:

Sampled with bailer next morning.

Well Monitoring Data Sheet

Project # 1365097 *00	Client: Valley Water Management
Sampler RPiwi4	Start Date: 12/22/14
Well I.D. RTH #1	Well Diameter 2 3 4 6 8 Other:
Total Well Depth: 73.30	Depth to Water: Pre: 48.15 Post: 52.00 @ Sampling
Depth to Free Product:	thickness of Free Product: (feet):
Reference to: PVC Grade	Flow Cell Type: YSI 6920

Purge Method: 2"Grundfos Pump Peristalitic Pump Bladder Pump Other:

Sample Method: Dedicated Tubing New Tubing Disposable Bailers Other:

Flow Rate: Pump Depth:

Well Volume Calculation (Fill in Before Purging)	Total Depth (ft)	-	Depth to Water (ft)	=	Water Column (ft)	Multiplier for Casing Diameter (in) 2	4	6	=	48.28 Casing Volume (gal)
	73.30		48.15		25.15	0.16	0.64	1.44		16.09

1245 Time	Temp (°C or °F)	pH	Cond. (mS or uS)	Turbiditiy (NTUs)	D.O. ((mg/l)	ORP (mV)	Water Removed (gals. or mL)	Observations DTW
1250	22.46	6.74	8245	14.7	1.07	47.9	5.0	53.50
1300	22.51	6.73	8410	55.0	1.06	38.0	15.00	60.40
1310	22.57	6.75	8442	75.3	1.44	32.7	25	66.17
1315	22.41	6.77	8444	51.4	1.67	32.0	30	68.50
1319								Dry (Below pump intake)

Did well dewater? Yes No	Amount actually evacuated:
Sampling Time: 1410	Sampling Date: 12/22/14
Sample I.D.: RTH#1-122214	Laboratory: BC Labs
Analyzed for TPHg BTEX	MTBE TPHd OTHER:
Equipment Blank I.D.: @ Time	Duplicate I.D.: QCFD-01-141222

BC Laboratories, Inc.

Chain of Custody Form

Page 1 of ___

Report To:
Client: Kennedy Jenks
Attn: Mike McLeod
Street Address: 303 Second St
City, State, Zip: San Francisco, CA
Phone: 415 243-2508 Fax: 415 896-0999
Email Address:
Work Order #:

Project #: 1365027*00
Project Name: Race Track Hill
Sampler(s): R. Prinz

Analysis Requested: Total metals; Dissolved metals (Field Filtered); pH, TDS, SO4, NO3, Cl; Alk, CO3, HCO3; TPH Crude Oil; Total Coliform, Fecal Coliform

Please refer to the back of this page for completion instructions and method legend.

Comments: See attached list for complete analysis. Dissolved metals were field filtered

Are there any tests with holding times less than or equal to 48 hours? ☒ Yes ☐ No

* Standard Turnaround = 10 work days

Sample #	Description	Date Sampled	Time Sampled	Total metals	Dissolved metals (Field Filtered)	pH, TDS, SO4, NO3, Cl	Alk, CO3, HCO3	TPH Crude Oil	Total Coliform, Fecal Coliform					Soil	Sludge	Drinking Water	Ground Water	Waste Water	Other	Turnaround # of work days*	Notes
	RTH #5 - 122114	12/21/14	1430	X	X	X	→	X	X								X				
	RTH #4 - 122214	12/22/14	0905	X	X	X	→	X	X								X				
	RTH #1 - 122214	12/22/14	1410	X	X	X	→	X	X								X				
	QCFD - 01 - 141222	12/22/14	—	X	X	X	→	X	X								X				

Billing ☒ Same as above
Client:
Address:
City: State Zip
Attn:
PO#:

EDF Required? Geotracker ☐ Yes ☐ No
Send Copy to State of CA? (EDT) ☐ Yes ☐ No

Global ID (Needed for EDF)
System # (Needed for EDT)

	Relinquished By	Date	Time	Received By	Date	Time
1.	[signature]	12/22/14	1805	[signature]	12/22/14	1805
2.						
3.						

BC Laboratories, Inc.

Chain of Custody Form

Page 1 of 1

Report To: Client: Kennedy Jenks	Project #: 1365027*00
Attn: Mike McLeod	Project Name: Race Track Hill
Street Address: 303 Second St	
City, State, Zip: San Francisco, CA	Sampler(s): R. Prince
Phone: 415 243-2508 Fax: 415 896-0999	
Email Address:	
Work Order #:	

Analysis Requested

Please refer to the back of this page for completion instructions and method legend.

Comments: See attached list for complete analysis. Dissolved metals were field filtered.

Are there any tests with holding times less than or equal to 48 hours? [X] Yes [ ] No

* Standard Turnaround = 10 work days

Sample #	Description	Date Sampled	Time Sampled	Total Metals	Dissolved Metals (Field Filtered)	pH, TDS, SO_4, NO_3, Cl	Alk, CO_3, HCO_3, OH	TPH (Ext)	Total Organic Carbon	Soil	Sludge	Drinking Water	Ground Water	Waste Water	Other	Turnaround # of work days*	Notes
	RTH#6-122314	12/23/14	0830	X	X	X	→	X	X					X			
	RTH#3-122314	12/23/14	1000	X	X	X	→	X	X					X			

Billing [X] Same as above

Client:

Address:

City: State Zip

Attn:

PO#:

EDF Required? Geotracker [ ] Yes [ ] No

Send Copy to State of CA? (EDT) [ ] Yes [ ] No

Global ID (Needed for EDF)

System # (Needed for EDT)

Relinquished By	Date	Time	Received By	Date	Time
1. Relinquished By: [signature]	12/23/14		1. Received By: [signature]	12/23/14	1125
2. Relinquished By			2. Received By		
3. Relinquished By			3. Received By		

Sample Chain-of-Custody/Analysis Request

Kennedy/Jenks Consultants

Possible Hazards ______

Client: Kennedy Jenks
Site: Rose Track Hill
Project No.: 1365027*00
Sampler Name: R. Prince
Telephone: (415) 243-2150

Report to: Mike McLeod
Company: Kennedy Jenks
Address: 303 Second St, San Francisco, CA 94107
Fax: (415) 896-0999

Lab Destination: Environmental Isotope Laboratory, U of A, Dept of Geoscience
Address: Gould-Simpson Bld, Tucson, AZ 85721
Telephone: (520) 621-1638
Carrier/Way Bill No.: Fed Ex 5770 8251 7984

(1) Lab ID No.	(1) Client ID No.	Collection Date	Collection Time	(2) Type	Depth	(3) Comp.	(4) Pres.	Turn-around	(5) Analyses Requested: Oxygen 18	Deuterium								Comment/Conditions (container type, container number, etc.)
	RTH #5 - 122114	12/21/14	1430				None		X	X								
	RTH #4 - 122214	12/22/14	0905				↓		X	X								
	RTH #1 - 122214	12/22/14	1410				↓		X	X								
	RTH #6 - 122314	12/23/14	0830				↓		X	X								
	RTH #3 - 122314	12/23/14	1000				↓		X	X								

(1) Write only one sample number in each space.
(2) Specify type of sample(s): Water (W), Solid (S), or indicate type.
(3) Mark each sample which should be composited in Laboratory as follows: Place an "A" in box for each sample that should be composited into one sample; use sequential letter for additional groups.
(4) Preservation of sample.
(5) Write each analysis requested across top. Place an "X" in appropriate column to indicate type of analysis needed for each sample.

Sample Relinquished By: Print Name	Signature	Company	Date	Time	Sample Received By: Print Name	Signature	Company	Date	Time
R. Prince	[signature]	Kennedy Jenks	12/30/14	1200					

FedEx Express NEW Package US Airbill

FedEx Tracking Number 8770 8251 7984

13 15 9 SLA1

Form ID No. 0215 — Sender's Copy

1 From *Please print and press hard.*

Date 12/30/14 — Sender's FedEx Account Number SENDER'S FEDEX ACCOUNT NUMBER ONLY 1141-8440-3

Sender's Name Ron Prince — Phone 714) 970-5186

Company KENNEDY JENKS CONSULTANTS

Address 3210 El Camino Real ~~2355 MAIN ST~~

Dept./Floor/Suite/Room

City IRVINE State CA ZIP 92602 ~~92614-6260~~

2 Your Internal Billing Reference First 24 characters will appear on invoice. 1365027*00

3 To Recipient's Name Christopher Eastoe — Phone (520) 621-1638

Company Environmental Isotope Laboratory

Address University of Arizona, Dept of Geosciences

We cannot deliver to P.O. boxes or P.O. ZIP codes. Dept./Floor/Suite/Room

Address Gould-Simpson Building

Use this line for the HOLD location address or for continuation of your shipping address.

☐ HOLD Weekday — FedEx location address REQUIRED. NOT available for FedEx First Overnight.

☐ HOLD Saturday — FedEx location address REQUIRED. Available ONLY for FedEx Priority Overnight and FedEx 2Day to select locations.

City Tucson State AZ ZIP 85721-0077

0443453810

! **The FedEx US Airbill has changed. See Section 4.** For shipments over 150 lbs., order the new FedEx Express Freight US Airbill.

4 Express Package Service *To most locations. — **Packages up to 150 lbs.** *For packages over 150 lbs., use the new FedEx Express Freight US Airbill.*

NOTE: Service order has changed. Please select carefully.

Next Business Day

- ☐ FedEx First Overnight — Earliest next business morning delivery to select locations. Friday shipments will be delivered on Monday unless SATURDAY Delivery is selected.
- ☐ FedEx Priority Overnight — Next business morning.* Friday shipments will be delivered on Monday unless SATURDAY Delivery is selected.
- ☒ FedEx Standard Overnight — Next business afternoon.* Saturday Delivery NOT available.

2 or 3 Business Days

- ☐ NEW FedEx 2Day A.M. — Second business morning.* Saturday Delivery NOT available.
- ☐ FedEx 2Day — Second business afternoon.* Thursday shipments will be delivered on Monday unless SATURDAY Delivery is selected.
- ☐ FedEx Express Saver — Third business day.* Saturday Delivery NOT available.

5 Packaging *Declared value limit $500.

☐ FedEx Envelope* ☐ FedEx Pak* ☐ FedEx Box ☐ FedEx Tube ☒ Other

6 Special Handling and Delivery Signature Options

☐ SATURDAY Delivery — NOT available for FedEx Standard Overnight, FedEx 2Day A.M., or FedEx Express Saver.

☐ No Signature Required — Package may be left without obtaining a signature for delivery.

☐ Direct Signature — Someone at recipient's address may sign for delivery. *Fee applies.*

☐ Indirect Signature — If no one is available at recipient's address, someone at a neighboring address may sign for delivery. For residential deliveries only. *Fee applies.*

Does this shipment contain dangerous goods? One box must be checked.

☒ No ☐ Yes — As per attached Shipper's Declaration. ☐ Yes — Shipper's Declaration not required. ☐ Dry Ice — Dry Ice, 9, UN 1845 ____ x ____ kg

Dangerous goods (including dry ice) cannot be shipped in FedEx packaging or placed in a FedEx Express Drop Box. ☐ Cargo Aircraft Only

7 Payment *Bill to:* Enter FedEx Acct. No. or Credit Card No. below.

☒ Sender — Acct. No. in Section 1 will be billed. ☐ Recipient ☐ Third Party ☐ Credit Card ☐ Cash/Check

FedEx Acct. No. Credit Card No. Exp. Date

Total Packages 1 — Total Weight 22 lbs. — Total Declared Value† $ ____ .00

†Our liability is limited to $100 unless you declare a higher value. See back for details. By using this Airbill you agree to the service conditions on the back of this Airbill and in the current FedEx Service Guide, including terms that limit our liability.

611

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FedEx

2500 KIMBERLY AVENUE
Fullerton, CA 92831

tion:	FULCE
ce ID:	FULCE-POS02
oyee:	62641
saction:	840115772426

DARD OVERNIGHT

082517984	21.60 lb (S)	114.82

duled Delivery Date 12/31/2014

Shipment subtotal:	114.82
Total Due:	**114.82**
FedEx Account: *****4403	114.82

M = Weight entered manually
S = Weight read from scale
T = Taxable item

t to additional charges. See FedEx Service Guide
ex.com for details. All merchandise sales final.

Visit us at: fedex.com
Or call 1.800.GoFedEx
1.800.463.3339

December 30, 2014 9:56:05 AM

Appendix B-5

Monitoring Well Sample Laboratory Reports

Date of Report: 01/05/2015

Stuart Childs

Kennedy/Jenks Consultants
303 Second Street, Suite 300
San Francisco, CA 94107

Client Project:	1365027.00
BCL Project:	Race Track Hill
BCL Work Order:	1430572
Invoice ID:	B192463

Enclosed are the results of analyses for samples received by the laboratory on 12/22/2014. If you have any questions concerning this report, please feel free to contact me.

Sincerely,

Contact Person: Misty Orton
Client Service Rep

Authorized Signature

Certifications: CA ELAP #1186; NV #CA00014; OR ELAP #4032-001; AK UST101

Table of Contents

BC Laboratories, Inc.

Chain of Custody Form

Page 1 of ___

Report To:
Client: Kennedy Jenks
Attn: Mike McLeod
Street Address: 303 Second St
City, State, Zip: San Francisco, CA
Phone: 415 243-2508 Fax: 415 896-0999
Email Address:
Work Order #: 14-30572

Project #: 1365027*00
Project Name: Race Track Hill
Sampler(s): R. Prince

Comments:
See attached list for complete analysis.
Dissolved metals were Field Filtered.

Are there any tests with holding times less than or equal to 48 hours? ☒ Yes ☐ No
* Standard Turnaround = 10 work days

Analysis Requested (Please refer to the back of this page for completion instructions and method legend.)

Sample #	Description	Date Sampled	Time Sampled	Total Metals	Dissolved Metals (Field Filtered)	pH, TDS, SO_4, NO_3, Cl	Alk, CO_3, HCO_3	TPH Gas/Oil	Total Coliform, Fecal Coliform	Soil	Sludge	Drinking Water	Ground Water	Waste Water	Other	Turnaround # of work days*	Notes
-1	RTH #5 - 122114	12/21/14	1430	X	X	X	→	X	X				X				
-2	RTH #4 - 122214	12/22/14	0905	X	X	X	→	X	X				X				
-3	RTH #1 - 122214	12/22/14	1410	X	X	X	→	X	X				X				
-4	QCFD - 01 - 141222	12/22/14	—	X	X	X	→	X	X				X				

CHK BY DISTRIBUTION
SUB-OUT

SHORT HOLDING TIME
Cr^{+6} NO_2 NO_3 OP SS
DO Cl_2 BOD MBAS COT

Billing ☒ Same as above
Client:
Address:
City: State Zip
Attn:
PO#:

EDF Required? Geotracker ☐ Yes ☐ No
Send Copy to State of CA? (EDT) ☐ Yes ☐ No

Global ID (Needed for EDF)
System # (Needed for EDT)

Relinquished By	Date	Time	Received By	Date	Time
1. [signature]	12/22/14	1805	1. [signature]	12/22/14	1805
2.			2.		
3.			3.		

BC Laboratories, Inc. – 4100 Atlas Ct. – Bakersfield, CA 93308 – 661.327.4911 – Fax: 661.327.1918 – www.bclabs.com

Kennedy/Jenks Consultants

Table 1: Groundwater Sample Test Methods

14-30572

Constituent	Test Method(a)	Reporting Limit	Container(b)	Sample Volume(c)	Preservative(d)	Holding Time(e)
pH	SM4500-HB	0.1 unit	P	250 ml	None	24 hours
Electroconductivity (EC)	EPA 120.1	1 (µmhos/cm(f) @ 25°C)	P	250 ml	None	28 days
Nitrate - Nitrogen (NO_3 as N)	EPA 300.0	0.1 mg/l(g)	P	250 ml	None	48 hours
Total Dissolved Solids (TDS)	SM2540C	10 mg/l	P	250 ml	None	7 days
Total Organic Carbon (TOC)	EPA 415.3	1.0 mg/l	P	250 ml	H_2SO_4 pH<2	28 days
Boron (B)	EPA 200.7	0.1 mg/l	P	250 ml	HNO_3 pH<2	6 months
Chloride (Cl)	EPA 300.0	0.2 mg/l	P	250 ml	None	28 days
Calcium (Ca)	EPA 200.7	0.5 mg/l	P	250 ml	HNO_3 pH<2	6 months
Magnesium (Mg)	EPA 200.7	0.5 mg/l	P	250 ml	HNO_3 pH<2	6 months
Sodium (Na)	EPA 200.7	0.5 mg/l	P	250 ml	HNO_3 pH<2	6 months
Potassium (K)	EPA 200.7	0.5 mg/l	P	250 ml	HNO_3 pH<2	6 months
Sulfate (SO_4)	EPA 300.0	5.0 mg/l	P	250 ml	None	28 days
Alkalinity as Carbonate (CO_3)	EPA 310.1	1.0 mg/l	P	250 ml	None	14 days
Alkalinity as Bicarbonate (HCO_3)	EPA 310.1	1.0 mg/l	P	250 ml	None	14 days
TPH-Crude Oil (TPHc)	EPA 8015B	0.1 mg/l	G	1000 ml	None	14 days
~~Oxygen Isotopes~~	~~CRDS(h)~~	~~n/a~~	~~G~~	~~10 ml~~	~~None~~	~~1-3 months~~
~~Hydrogen Isotopes~~	~~CRDS~~	~~n/a~~	~~G~~	~~10 ml~~	~~None~~	~~1-3 months~~

Notes:

(a) EPA = U.S. Environmental Protection Agency
SM = Standard Methods
(b) P = Polyethylene; G = Glass
(c) ml = milliliter
(d) H_2SO_4 pH<2 = sulfuric acid at pH 2 or less; HNO_3 pH<2 = nitric acid at pH 2 or less
(e) All samples should be kept at 4 degrees Celsius from the time of collection until analysis.
(f) µmho/cm = micromhos per centimeter
(g) mg/l = milligrams per liter
(h) Cavity Ring-Down Spectrometer

Phase 2 Investigation Work Plan, Race Track Hill Area
Valley Water Management Company, Edison Oil Field, California Page 1 of 1
G:\IB-Group\Admin\Job\13\1365027.00_VWMC\09-Reports\Ph2-Investigation-WPlan\Tables\Table 01 Water Test Methods_mrw.docm

Chain of Custody and Cooler Receipt Form for 1430572 Page 3 of 3

BC LABORATORIES INC. — **COOLER RECEIPT FORM** Rev. No. 18 09/04/14 Page 1 Of 1

Submission #: 14-30572

SHIPPING INFORMATION
Federal Express ☐ UPS ☐ Hand Delivery ☒
BC Lab Field Service ☐ Other ☐ (Specify)______

SHIPPING CONTAINER
Ice Chest ☒ None ☐ Box ☐
Other ☐ (Specify)______

FREE LIQUID
YES ☐ NO ☐

Refrigerant: Ice ☒ Blue Ice ☐ None ☐ Other ☐ Comments:

Custody Seals: Ice Chest ☐ Intact? Yes ☐ No ☐ | Containers ☐ Intact? Yes ☐ No ☐ | None ☒ Comments:

All samples received? Yes ☒ No ☐ All samples containers intact? Yes ☒ No ☐ Description(s) match COC? Yes ☒ No ☐

COC Received ☒ YES ☐ NO

Emissivity: 0.98 Container: PE Thermometer ID: 208
Temperature: (A) 3.4 °C / (C) 3.8 °C

Date/Time 12/22/14 1806
Analyst Init KIB

SAMPLE CONTAINERS	1	2	3	4	5	6	7	8	9	10
QT GENERAL MINERAL/ GENERAL	AB	AB	AB	AB						
PT PE UNPRESERVED										
QT INORGANIC CHEMICAL METALS										
PT INORGANIC CHEMICAL METALS	CD	CD	CD	CD						
PT CYANIDE										
PT NITROGEN FORMS										
PT TOTAL SULFIDE										
2oz. NITRATE / NITRITE										
PT TOTAL ORGANIC CARBON	E	E	E	E						
PT TOX										
PT CHEMICAL OXYGEN DEMAND										
PtA PHENOLICS										
40ml VOA VIAL TRAVEL BLANK										
40ml VOA VIAL										
QT EPA 413.1, 413.2, 418.1										
PT ODOR										
RADIOLOGICAL										
BACTERIOLOGICAL										
40 ml VOA VIAL- 504										
QT EPA 508/608/8080										
QT EPA 515.1/8150										
QT EPA 525										
QT EPA 525 TRAVEL BLANK										
40ml EPA 547										
40ml EPA 531.1										
8oz Amber EPA 548										
QT EPA 549										
QT EPA 632										
QT EPA 8015M	F	F	F	F						
QT AMBER										
8 OZ. JAR										
32 OZ. JAR										
SOIL SLEEVE										
PCB VIAL										
PLASTIC BAG										
FERROUS IRON										
ENCORE										
SMART KIT										
Summa Canister										

Comments:______
Sample Numbering Completed By: KIB Date/Time: 12/22/14 1840 [S:\WPDoc\WordPerfect\LAB_DOCS\FORMS\SAMREC]

Kennedy/Jenks Consultants		**Reported:**	01/05/2015 17:11
303 Second Street, Suite 300		Project:	Race Track Hill
San Francisco, CA 94107		Project Number:	1365027.00
		Project Manager:	Stuart Childs

Laboratory / Client Sample Cross Reference

Laboratory	Client Sample Information			
1430572-01	**COC Number:**	---	**Receive Date:**	12/22/2014 18:05
	Project Number:	---	**Sampling Date:**	12/21/2014 14:30
	Sampling Location:	---	**Sample Depth:**	---
	Sampling Point:	RTH #5 - 122114	**Lab Matrix:**	Water
	Sampled By:	R. Prince	**Sample Type:**	Groundwater
			Metal Analysis: 1-Field Filtered and Acidified	
1430572-02	**COC Number:**	---	**Receive Date:**	12/22/2014 18:05
	Project Number:	---	**Sampling Date:**	12/22/2014 09:05
	Sampling Location:	---	**Sample Depth:**	---
	Sampling Point:	RTH #4 - 122214	**Lab Matrix:**	Water
	Sampled By:	R. Prince	**Sample Type:**	Groundwater
			Metal Analysis: 1-Field Filtered and Acidified	
1430572-03	**COC Number:**	---	**Receive Date:**	12/22/2014 18:05
	Project Number:	---	**Sampling Date:**	12/22/2014 14:10
	Sampling Location:	---	**Sample Depth:**	---
	Sampling Point:	RTH #1 - 122214	**Lab Matrix:**	Water
	Sampled By:	R. Prince	**Sample Type:**	Groundwater
			Metal Analysis: 1-Field Filtered and Acidified	
1430572-04	**COC Number:**	---	**Receive Date:**	12/22/2014 18:05
	Project Number:	---	**Sampling Date:**	12/22/2014 00:00
	Sampling Location:	---	**Sample Depth:**	---
	Sampling Point:	QCED - 01 - 141222	**Lab Matrix:**	Water
	Sampled By:	R. Prince	**Sample Type:**	Groundwater
			Metal Analysis: 1-Field Filtered and Acidified	

Kennedy/Jenks Consultants		**Reported:**	01/05/2015 17:11
303 Second Street, Suite 300		Project:	Race Track Hill
San Francisco, CA 94107		Project Number:	1365027.00
		Project Manager:	Stuart Childs

Total Petroleum Hydrocarbons

BCL Sample ID: 1430572-01 **Client Sample Name:** RTH #5 - 122114, 12/21/2014 2:30:00PM, R. Prince

Constituent	Result	Units	PQL	MDL	Method	MB Bias	Lab Quals	Run #
TPH - Crude Oil	ND	ug/L	500	140	EPA-8015B/FFP	ND		1
Tetracosane (Surrogate)	81.9	%	37 - 134 (LCL - UCL)		EPA-8015B/FFP			1

Run #	Method	Prep Date	Run Date/Time	Analyst	Instrument	Dilution	QC Batch ID
1	EPA-8015B/FFP	12/23/14	12/24/14 16:29	MWB	GC-2	1	BXL2238

Kennedy/Jenks Consultants		Reported:	01/05/2015 17:11
303 Second Street, Suite 300		Project:	Race Track Hill
San Francisco, CA 94107		Project Number:	1365027.00
		Project Manager:	Stuart Childs

Water Analysis (General Chemistry)

BCL Sample ID: 1430572-01 **Client Sample Name:** RTH #5 - 122114, 12/21/2014 2:30:00PM, R. Prince

Constituent	Result	Units	PQL	MDL	Method	MB Bias	Lab Quals	Run #
Dissolved Calcium	**62**	**mg/L**	**0.10**	**0.016**	**EPA-200.7**	ND		1
Total Recoverable Calcium	**64**	**mg/L**	**0.10**	**0.014**	**EPA-200.7**	ND		2
Dissolved Magnesium	**22**	**mg/L**	**0.050**	**0.019**	**EPA-200.7**	ND		1
Total Recoverable Magnesium	**23**	**mg/L**	**0.050**	**0.019**	**EPA-200.7**	ND		2
Dissolved Sodium	**50**	**mg/L**	**0.50**	**0.051**	**EPA-200.7**	ND		1
Total Recoverable Sodium	**51**	**mg/L**	**0.50**	**0.051**	**EPA-200.7**	ND		2
Dissolved Potassium	**6.3**	**mg/L**	**1.0**	**0.10**	**EPA-200.7**	ND		1
Total Recoverable Potassium	**6.4**	**mg/L**	**1.0**	**0.10**	**EPA-200.7**	ND		2
Bicarbonate Alkalinity as CaCO3	**220**	**mg/L**	**4.1**	**4.1**	**EPA-310.1**	ND		3
Carbonate Alkalinity as CaCO3	ND	mg/L	4.1	4.1	EPA-310.1	ND		3
Alkalinity as CaCO3	**220**	**mg/L**	**4.1**	**4.1**	**Calc**	ND		4
Chloride	**26**	**mg/L**	**0.50**	**0.061**	**EPA-300.0**	ND		5
Nitrate as N	**0.57**	**mg/L**	**0.10**	**0.018**	**EPA-300.0**	ND		5
Sulfate	**92**	**mg/L**	**1.0**	**0.10**	**EPA-300.0**	ND		5
pH	**7.69**	**pH Units**	**0.05**	**0.05**	**EPA-150.1**		**S05**	6
Electrical Conductivity @ 25 C	**624**	**umhos/cm**	**1.00**	**1.00**	**EPA-120.1**			7
Total Dissolved Solids @ 180 C	**450**	**mg/L**	**20**	**20**	**SM-2540C**	ND		8
Non-Volatile Organic Carbon	ND	mg/L	1.0	0.30	EPA-415.1	ND		9

Run #	Method	Prep Date	Run Date/Time	Analyst	Instrument	Dilution	QC Batch ID
1	EPA-200.7	12/21/14	12/24/14 13:25	JRG	PE-OP2	1	BXL2262
2	EPA-200.7	12/31/14	12/31/14 17:14	JRG	PE-OP2	1	BXL2791
3	EPA-310.1	12/26/14	12/26/14 12:26	RML	MET-1	1	BXL2456
4	Calc	12/24/14	01/05/15 07:49	MSA	Calc	1	BXL2319
5	EPA-300.0	12/22/14	12/23/14 00:27	BMW	IC8	1	BXL2267
6	EPA-150.1	12/26/14	12/26/14 12:26	RML	MET-1	1	BXL2456
7	EPA-120.1	12/26/14	12/26/14 12:26	RML	MET-1	1	BXL2456
8	SM-2540C	12/26/14	12/26/14 14:00	CAD	MANUAL	2	BXL2405
9	EPA-415.1	12/24/14	12/24/14 10:20	ALW	TOC2	1	BXL2125

Kennedy/Jenks Consultants	**Reported:** 01/05/2015 17:11
303 Second Street, Suite 300	Project: Race Track Hill
San Francisco, CA 94107	Project Number: 1365027.00
	Project Manager: Stuart Childs

Metals Analysis

BCL Sample ID: 1430572-01 **Client Sample Name:** RTH #5 - 122114, 12/21/2014 2:30:00PM, R. Prince

Constituent	Result	Units	PQL	MDL	Method	MB Bias	Lab Quals	Run #
Dissolved Boron	**69**	**ug/L**	**100**	**10**	**EPA-200.7**	ND	**J**	1
Total Recoverable Boron	**66**	**ug/L**	**100**	**10**	**EPA-200.7**	ND	**J**	2

Run #	Method	Prep Date	Run Date/Time	Analyst	Instrument	Dilution	QC Batch ID
1	EPA-200.7	12/21/14	12/24/14 13:25	JRG	PE-OP2	1	BXL2262
2	EPA-200.7	12/31/14	12/31/14 17:14	JRG	PE-OP2	1	BXL2791

Kennedy/Jenks Consultants	**Reported:** 01/05/2015 17:11
303 Second Street, Suite 300	Project: Race Track Hill
San Francisco, CA 94107	Project Number: 1365027.00
	Project Manager: Stuart Childs

Total Petroleum Hydrocarbons

BCL Sample ID: 1430572-02 | **Client Sample Name:** RTH #4 - 122214, 12/22/2014 9:05:00AM, R. Prince

Constituent	Result	Units	PQL	MDL	Method	MB Bias	Lab Quals	Run #
TPH - Crude Oil	ND	ug/L	500	140	EPA-8015B/FFP	ND		1
Tetracosane (Surrogate)	90.1	%	37 - 134 (LCL - UCL)		EPA-8015B/FFP			1

Run #	Method	Prep Date	Run Date/Time	Analyst	Instrument	Dilution	QC Batch ID
1	EPA-8015B/FFP	12/23/14	12/24/14 16:51	MWB	GC-2	1	BXL2238

Kennedy/Jenks Consultants
303 Second Street, Suite 300
San Francisco, CA 94107

Reported: 01/05/2015 17:11
Project: Race Track Hill
Project Number: 1365027.00
Project Manager: Stuart Childs

Water Analysis (General Chemistry)

BCL Sample ID: 1430572-02 | **Client Sample Name:** RTH #4 - 122214, 12/22/2014 9:05:00AM, R. Prince

Constituent	Result	Units	PQL	MDL	Method	MB Bias	Lab Quals	Run #
Dissolved Calcium	**490**	**mg/L**	**0.10**	**0.016**	**EPA-200.7**	ND		1
Total Recoverable Calcium	**490**	**mg/L**	**0.10**	**0.014**	**EPA-200.7**	ND		2
Dissolved Magnesium	**170**	**mg/L**	**0.050**	**0.019**	**EPA-200.7**	ND		1
Total Recoverable Magnesium	**180**	**mg/L**	**0.050**	**0.019**	**EPA-200.7**	ND		2
Dissolved Sodium	**630**	**mg/L**	**0.50**	**0.051**	**EPA-200.7**	ND		1
Total Recoverable Sodium	**680**	**mg/L**	**0.50**	**0.051**	**EPA-200.7**	ND		2
Dissolved Potassium	**22**	**mg/L**	**1.0**	**0.10**	**EPA-200.7**	ND		1
Total Recoverable Potassium	**23**	**mg/L**	**1.0**	**0.10**	**EPA-200.7**	ND		2
Bicarbonate Alkalinity as CaCO3	**210**	**mg/L**	**8.2**	**8.2**	**EPA-310.1**	ND		3
Carbonate Alkalinity as CaCO3	ND	mg/L	8.2	8.2	EPA-310.1	ND		3
Alkalinity as CaCO3	**210**	**mg/L**	**8.2**	**8.2**	**Calc**	ND		4
Chloride	**2000**	**mg/L**	**5.0**	**0.61**	**EPA-300.0**	ND	**A01**	5
Nitrate as N	**3.4**	**mg/L**	**1.0**	**0.18**	**EPA-300.0**	ND	**A10**	5
Sulfate	**370**	**mg/L**	**10**	**1.0**	**EPA-300.0**	ND	**A01**	5
pH	**7.38**	**pH Units**	**0.05**	**0.05**	**EPA-150.1**		**S05**	6
Electrical Conductivity @ 25 C	**6540**	**umhos/cm**	**1.00**	**1.00**	**EPA-120.1**			7
Total Dissolved Solids @ 180 C	**5100**	**mg/L**	**200**	**200**	**SM-2540C**	ND		8
Non-Volatile Organic Carbon	**1.1**	**mg/L**	**1.0**	**0.30**	**EPA-415.1**	ND		9

Run #	Method	Prep Date	Run Date/Time	Analyst	Instrument	Dilution	QC Batch ID
1	EPA-200.7	12/22/14	12/24/14 13:37	JRG	PE-OP2	1	BXL2262
2	EPA-200.7	12/31/14	12/31/14 17:33	JRG	PE-OP2	1	BXL2791
3	EPA-310.1	12/26/14	12/26/14 12:38	RML	MET-1	2	BXL2456
4	Calc	12/24/14	01/05/15 07:49	MSA	Calc	1	BXL2319
5	EPA-300.0	12/22/14	12/23/14 01:26	OLH	IC8	10	BXL2267
6	EPA-150.1	12/26/14	12/26/14 12:38	RML	MET-1	1	BXL2456
7	EPA-120.1	12/26/14	12/26/14 12:38	RML	MET-1	1	BXL2456
8	SM-2540C	12/26/14	12/26/14 14:00	CAD	MANUAL	20	BXL2405
9	EPA-415.1	12/24/14	12/24/14 10:35	ALW	TOC2	1	BXL2125

Kennedy/Jenks Consultants 303 Second Street, Suite 300 San Francisco, CA 94107	**Reported:** 01/05/2015 17:11 Project: Race Track Hill Project Number: 1365027.00 Project Manager: Stuart Childs

Metals Analysis

BCL Sample ID: 1430572-02 | **Client Sample Name:** RTH #4 - 122214, 12/22/2014 9:05:00AM, R. Prince

Constituent	Result	Units	PQL	MDL	Method	MB Bias	Lab Quals	Run #
Dissolved Boron	**5200**	**ug/L**	**100**	**10**	**EPA-200.7**	ND		1
Total Recoverable Boron	**5400**	**ug/L**	**100**	**10**	**EPA-200.7**	ND		2

Run #	Method	Prep Date	Run Date/Time	Analyst	Instrument	Dilution	QC Batch ID
1	EPA-200.7	12/22/14	12/24/14 13:37	JRG	PE-OP2	1	BXL2262
2	EPA-200.7	12/31/14	12/31/14 17:33	JRG	PE-OP2	1	BXL2791

Kennedy/Jenks Consultants 303 Second Street, Suite 300 San Francisco, CA 94107	**Reported:** 01/05/2015 17:11 Project: Race Track Hill Project Number: 1365027.00 Project Manager: Stuart Childs

Total Petroleum Hydrocarbons

BCL Sample ID: 1430572-03 | **Client Sample Name:** RTH #1 - 122214, 12/22/2014 2:10:00PM, R. Prince

Constituent	Result	Units	PQL	MDL	Method	MB Bias	Lab Quals	Run #
TPH - Crude Oil	ND	ug/L	500	140	EPA-8015B/FFP	ND		1
Tetracosane (Surrogate)	82.8	%	37 - 134 (LCL - UCL)		EPA-8015B/FFP			1

Run #	Method	Prep Date	Run Date/Time	Analyst	Instrument	Dilution	QC Batch ID
1	EPA-8015B/FFP	12/23/14	12/24/14 17:14	MWB	GC-2	1	BXL2238

Kennedy/Jenks Consultants		Reported:	01/05/2015 17:11
303 Second Street, Suite 300		Project:	Race Track Hill
San Francisco, CA 94107		Project Number:	1365027.00
		Project Manager:	Stuart Childs

Water Analysis (General Chemistry)

BCL Sample ID: 1430572-03 **Client Sample Name:** RTH #1 - 122214, 12/22/2014 2:10:00PM, R. Prince

Constituent	Result	Units	PQL	MDL	Method	MB Bias	Lab Quals	Run #
Dissolved Calcium	**520**	**mg/L**	**0.20**	**0.032**	**EPA-200.7**	ND	**A10**	1
Total Recoverable Calcium	**550**	**mg/L**	**0.20**	**0.028**	**EPA-200.7**	ND	**A10**	2
Dissolved Magnesium	**41**	**mg/L**	**0.10**	**0.038**	**EPA-200.7**	ND	**A10**	1
Total Recoverable Magnesium	**45**	**mg/L**	**0.10**	**0.038**	**EPA-200.7**	ND	**A10**	2
Dissolved Sodium	**1200**	**mg/L**	**1.0**	**0.10**	**EPA-200.7**	ND	**A01**	1
Total Recoverable Sodium	**1300**	**mg/L**	**1.0**	**0.10**	**EPA-200.7**	ND	**A01**	2
Dissolved Potassium	**8.1**	**mg/L**	**2.0**	**0.20**	**EPA-200.7**	ND	**A10**	1
Total Recoverable Potassium	**9.0**	**mg/L**	**2.0**	**0.20**	**EPA-200.7**	ND	**A10**	2
Bicarbonate Alkalinity as CaCO3	**220**	**mg/L**	**8.2**	**8.2**	**EPA-310.1**	ND		3
Carbonate Alkalinity as CaCO3	ND	mg/L	8.2	8.2	EPA-310.1	ND		3
Alkalinity as CaCO3	**220**	**mg/L**	**8.2**	**8.2**	**Calc**	ND		4
Chloride	**2900**	**mg/L**	**10**	**1.2**	**EPA-300.0**	ND	**A01**	5
Nitrate as N	**14**	**mg/L**	**2.0**	**0.36**	**EPA-300.0**	ND	**A01**	5
Sulfate	**42**	**mg/L**	**20**	**2.0**	**EPA-300.0**	ND	**A01**	5
pH	**7.26**	**pH Units**	**0.05**	**0.05**	**EPA-150.1**		**S05**	6
Electrical Conductivity @ 25 C	**8650**	**umhos/cm**	**1.00**	**1.00**	**EPA-120.1**			7
Total Dissolved Solids @ 180 C	**7000**	**mg/L**	**500**	**500**	**SM-2540C**	ND		8
Non-Volatile Organic Carbon	**1.6**	**mg/L**	**1.0**	**0.30**	**EPA-415.1**	ND		9

Run #	Method	Prep Date	Run Date/Time	Analyst	Instrument	Dilution	QC Batch ID
1	EPA-200.7	12/22/14	12/24/14 13:52	JRG	PE-OP2	2	BXL2262
2	EPA-200.7	12/31/14	12/31/14 17:46	JRG	PE-OP2	2	BXL2791
3	EPA-310.1	12/26/14	12/26/14 13:20	RML	MET-1	2	BXL2456
4	Calc	12/24/14	01/05/15 07:49	MSA	Calc	1	BXL2319
5	EPA-300.0	12/22/14	12/23/14 01:40	OLH	IC8	20	BXL2267
6	EPA-150.1	12/26/14	12/26/14 13:20	RML	MET-1	1	BXL2456
7	EPA-120.1	12/26/14	12/26/14 13:20	RML	MET-1	1	BXL2456
8	SM-2540C	12/26/14	12/26/14 14:00	CAD	MANUAL	50	BXL2405
9	EPA-415.1	12/24/14	12/24/14 10:49	ALW	TOC2	1	BXL2125

Kennedy/Jenks Consultants
303 Second Street, Suite 300
San Francisco, CA 94107

Reported: 01/05/2015 17:11
Project: Race Track Hill
Project Number: 1365027.00
Project Manager: Stuart Childs

Metals Analysis

BCL Sample ID: 1430572-03 **Client Sample Name:** RTH #1 - 122214, 12/22/2014 2:10:00PM, R. Prince

Constituent	Result	Units	PQL	MDL	Method	MB Bias	Lab Quals	Run #
Dissolved Boron	**15000**	**ug/L**	**200**	**20**	**EPA-200.7**	ND	**A10**	1
Total Recoverable Boron	**16000**	**ug/L**	**200**	**20**	**EPA-200.7**	ND	**A10**	2

Run #	Method	Prep Date	Run Date/Time	Analyst	Instrument	Dilution	QC Batch ID
1	EPA-200.7	12/22/14	12/24/14 13:52	JRG	PE-OP2	2	BXL2262
2	EPA-200.7	12/31/14	12/31/14 17:46	JRG	PE-OP2	2	BXL2791

Kennedy/Jenks Consultants		**Reported:**	01/05/2015 17:11
303 Second Street, Suite 300		Project:	Race Track Hill
San Francisco, CA 94107		Project Number:	1365027.00
		Project Manager:	Stuart Childs

Total Petroleum Hydrocarbons

BCL Sample ID: 1430572-04 **Client Sample Name:** QCED - 01 - 141222, 12/22/2014 12:00:00AM, R. Prince

Constituent	Result	Units	PQL	MDL	Method	MB Bias	Lab Quals	Run #
TPH - Crude Oil	ND	ug/L	500	140	EPA-8015B/FFP	ND		1
Tetracosane (Surrogate)	81.7	%	37 - 134 (LCL - UCL)		EPA-8015B/FFP			1

Run #	Method	Prep Date	Run Date/Time	Analyst	Instrument	Dilution	QC Batch ID
1	EPA-8015B/FFP	12/23/14	12/24/14 17:36	MWB	GC-2	1	BXL2238

Kennedy/Jenks Consultants	Reported:	01/05/2015 17:11
303 Second Street, Suite 300	Project:	Race Track Hill
San Francisco, CA 94107	Project Number:	1365027.00
	Project Manager:	Stuart Childs

Water Analysis (General Chemistry)

BCL Sample ID: 1430572-04 **Client Sample Name:** QCED - 01 - 141222, 12/22/2014 12:00:00AM, R. Prince

Constituent	Result	Units	PQL	MDL	Method	MB Bias	Lab Quals	Run #
Dissolved Calcium	**530**	**mg/L**	**0.20**	**0.032**	**EPA-200.7**	ND	**A10**	1
Total Recoverable Calcium	**560**	**mg/L**	**0.20**	**0.028**	**EPA-200.7**	ND	**A10**	2
Dissolved Magnesium	**41**	**mg/L**	**0.10**	**0.038**	**EPA-200.7**	ND	**A10**	1
Total Recoverable Magnesium	**45**	**mg/L**	**0.10**	**0.038**	**EPA-200.7**	ND	**A10**	2
Dissolved Sodium	**1200**	**mg/L**	**1.0**	**0.10**	**EPA-200.7**	ND	**A01**	1
Total Recoverable Sodium	**1300**	**mg/L**	**1.0**	**0.10**	**EPA-200.7**	ND	**A01**	2
Dissolved Potassium	**8.2**	**mg/L**	**2.0**	**0.20**	**EPA-200.7**	ND	**A10**	1
Total Recoverable Potassium	**9.0**	**mg/L**	**2.0**	**0.20**	**EPA-200.7**	ND	**A10**	2
Bicarbonate Alkalinity as CaCO3	**220**	**mg/L**	**8.2**	**8.2**	**EPA-310.1**	ND		3
Carbonate Alkalinity as CaCO3	ND	mg/L	8.2	8.2	EPA-310.1	ND		3
Alkalinity as CaCO3	**220**	**mg/L**	**8.2**	**8.2**	**Calc**	ND		4
Chloride	**2900**	**mg/L**	**10**	**1.2**	**EPA-300.0**	ND	**A01**	5
Nitrate as N	**11**	**mg/L**	**2.0**	**0.36**	**EPA-300.0**	ND	**A01**	5
Sulfate	**40**	**mg/L**	**20**	**2.0**	**EPA-300.0**	ND	**A10**	5
pH	**7.24**	**pH Units**	**0.05**	**0.05**	**EPA-150.1**		**S05**	6
Electrical Conductivity @ 25 C	**8700**	**umhos/cm**	**1.00**	**1.00**	**EPA-120.1**			7
Total Dissolved Solids @ 180 C	**7000**	**mg/L**	**500**	**500**	**SM-2540C**	ND		8
Non-Volatile Organic Carbon	**1.6**	**mg/L**	**1.0**	**0.30**	**EPA-415.1**	ND		9

Run #	Method	Prep Date	Run Date/Time	Analyst	Instrument	Dilution	QC Batch ID
1	EPA-200.7	12/22/14	12/24/14 13:54	JRG	PE-OP2	2	BXL2262
2	EPA-200.7	12/31/14	12/31/14 17:49	JRG	PE-OP2	2	BXL2791
3	EPA-310.1	12/26/14	12/26/14 13:27	RML	MET-1	2	BXL2456
4	Calc	12/24/14	01/05/15 07:49	MSA	Calc	1	BXL2319
5	EPA-300.0	12/22/14	12/23/14 01:55	OLH	IC8	20	BXL2267
6	EPA-150.1	12/26/14	12/26/14 13:27	RML	MET-1	1	BXL2456
7	EPA-120.1	12/26/14	12/26/14 13:27	RML	MET-1	1	BXL2456
8	SM-2540C	12/26/14	12/26/14 14:00	CAD	MANUAL	50	BXL2405
9	EPA-415.1	12/24/14	12/24/14 11:04	ALW	TOC2	1	BXL2125

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Reported: 01/05/2015 17:11
Project: Race Track Hill
Project Number: 1365027.00
Project Manager: Stuart Childs

Metals Analysis

BCL Sample ID:	1430572-04	Client Sample Name:	QCED - 01 - 141222, 12/22/2014 12:00:00AM, R. Prince

Constituent	Result	Units	PQL	MDL	Method	MB Bias	Lab Quals	Run #
Dissolved Boron	**15000**	**ug/L**	**200**	**20**	**EPA-200.7**	ND	**A10**	1
Total Recoverable Boron	**16000**	**ug/L**	**200**	**20**	**EPA-200.7**	ND	**A10**	2

Run #	Method	Prep Date	Run Date/Time	Analyst	Instrument	Dilution	QC Batch ID
1	EPA-200.7	12/22/14	12/24/14 13:54	JRG	PE-OP2	2	BXL2262
2	EPA-200.7	12/31/14	12/31/14 17:49	JRG	PE-OP2	2	BXL2791

Kennedy/Jenks Consultants	**Reported:** 01/05/2015 17:11
303 Second Street, Suite 300	Project: Race Track Hill
San Francisco, CA 94107	Project Number: 1365027.00
	Project Manager: Stuart Childs

Total Petroleum Hydrocarbons

Quality Control Report - Method Blank Analysis

Constituent	QC Sample ID	MB Result	Units	PQL	MDL	Lab Quals
QC Batch ID: BXL2238						
TPH - Crude Oil	BXL2238-BLK1	ND	ug/L	500	140	
Tetracosane (Surrogate)	**BXL2238-BLK1**	**84.4**	%	**37 - 134 (LCL - UCL)**		

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San Francisco, CA 94107	Project Number: 1365027.00
	Project Manager: Stuart Childs

Total Petroleum Hydrocarbons

Quality Control Report - Laboratory Control Sample

Constituent	QC Sample ID	Type	Result	Spike Level	Units	Percent Recovery	RPD	Control Limits Percent Recovery	Control Limits RPD	Lab Quals
QC Batch ID: BXL2238										
Tetracosane (Surrogate)	BXL2238-BS1	LCS	84.295	100.00	ug/L	84.3		37 - 134		

Kennedy/Jenks Consultants 303 Second Street, Suite 300 San Francisco, CA 94107	**Reported:** 01/05/2015 17:11 Project: Race Track Hill Project Number: 1365027.00 Project Manager: Stuart Childs

Total Petroleum Hydrocarbons

Quality Control Report - Precision & Accuracy

Constituent	Type	Source Sample ID	Source Result	Result	Spike Added	Units	RPD	Percent Recovery	Control Limits RPD	Control Limits Percent Recovery	Lab Quals
QC Batch ID: BXL2238	Used client sample: N										
Tetracosane (Surrogate)	MS	1425343-55	ND	85.265	100.00	ug/L		85.3		37 - 134	
	MSD	1425343-55	ND	43.105	100.00	ug/L	65.7	43.1		37 - 134	

Kennedy/Jenks Consultants	**Reported:** 01/05/2015 17:11
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San Francisco, CA 94107	Project Number: 1365027.00
	Project Manager: Stuart Childs

Water Analysis (General Chemistry)

Quality Control Report - Method Blank Analysis

Constituent	QC Sample ID	MB Result	Units	PQL	MDL	Lab Quals
QC Batch ID: BXL2125						
Non-Volatile Organic Carbon	BXL2125-BLK1	ND	mg/L	1.0	0.30	
QC Batch ID: BXL2262						
Dissolved Calcium	BXL2262-BLK1	ND	mg/L	0.10	0.016	
Dissolved Magnesium	BXL2262-BLK1	ND	mg/L	0.050	0.019	
Dissolved Sodium	BXL2262-BLK1	ND	mg/L	0.50	0.051	
Dissolved Potassium	BXL2262-BLK1	ND	mg/L	1.0	0.10	
QC Batch ID: BXL2267						
Chloride	BXL2267-BLK1	ND	mg/L	0.50	0.061	
Nitrate as N	BXL2267-BLK1	ND	mg/L	0.10	0.018	
Sulfate	BXL2267-BLK1	ND	mg/L	1.0	0.10	
QC Batch ID: BXL2319						
Alkalinity as CaCO3	BXL2319-BLK1	ND	mg/L	4.1	4.1	
QC Batch ID: BXL2405						
Total Dissolved Solids @ 180 C	BXL2405-BLK1	ND	mg/L	6.7	6.7	
QC Batch ID: BXL2456						
Bicarbonate Alkalinity as CaCO3	BXL2456-BLK1	ND	mg/L	4.1	4.1	
Carbonate Alkalinity as CaCO3	BXL2456-BLK1	ND	mg/L	4.1	4.1	
QC Batch ID: BXL2791						
Total Recoverable Calcium	BXL2791-BLK1	ND	mg/L	0.10	0.014	
Total Recoverable Magnesium	BXL2791-BLK1	ND	mg/L	0.050	0.019	
Total Recoverable Sodium	BXL2791-BLK1	ND	mg/L	0.50	0.051	
Total Recoverable Potassium	BXL2791-BLK1	ND	mg/L	1.0	0.10	

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San Francisco, CA 94107		Project Number:	1365027.00
		Project Manager:	Stuart Childs

Water Analysis (General Chemistry)

Quality Control Report - Laboratory Control Sample

Constituent	QC Sample ID	Type	Result	Spike Level	Units	Percent Recovery	RPD	Control Limits Percent Recovery	Control Limits RPD	Lab Quals
QC Batch ID: BXL2125										
Non-Volatile Organic Carbon	BXL2125-BS1	LCS	5.2640	5.0000	mg/L	105		85 - 115		
QC Batch ID: BXL2262										
Dissolved Calcium	BXL2262-BS1	LCS	9.9825	10.000	mg/L	99.8		85 - 115		
Dissolved Magnesium	BXL2262-BS1	LCS	10.293	10.000	mg/L	103		85 - 115		
Dissolved Sodium	BXL2262-BS1	LCS	9.8719	10.000	mg/L	98.7		85 - 115		
Dissolved Potassium	BXL2262-BS1	LCS	9.7945	10.000	mg/L	97.9		85 - 115		
QC Batch ID: BXL2267										
Chloride	BXL2267-BS1	LCS	50.546	50.000	mg/L	101		90 - 110		
Nitrate as N	BXL2267-BS1	LCS	4.6130	5.0000	mg/L	92.3		90 - 110		
Sulfate	BXL2267-BS1	LCS	100.66	100.00	mg/L	101		90 - 110		
QC Batch ID: BXL2405										
Total Dissolved Solids @ 180 C	BXL2405-BS1	LCS	560.00	586.00	mg/L	95.6		90 - 110		
QC Batch ID: BXL2456										
pH	BXL2456-BS2	LCS	7.0500	7.0000	pH Units	101		95 - 105		
Electrical Conductivity @ 25 C	BXL2456-BS1	LCS	303.50	303.00	umhos/cm	100		90 - 110		
QC Batch ID: BXL2791										
Total Recoverable Calcium	BXL2791-BS1	LCS	10.334	10.000	mg/L	103		85 - 115		
Total Recoverable Magnesium	BXL2791-BS1	LCS	10.807	10.000	mg/L	108		85 - 115		
Total Recoverable Sodium	BXL2791-BS1	LCS	10.498	10.000	mg/L	105		85 - 115		
Total Recoverable Potassium	BXL2791-BS1	LCS	10.153	10.000	mg/L	102		85 - 115		

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Reported: 01/05/2015 17:11
Project: Race Track Hill
Project Number: 1365027.00
Project Manager: Stuart Childs

Water Analysis (General Chemistry)

Quality Control Report - Precision & Accuracy

Constituent	Type	Source Sample ID	Source Result	Result	Spike Added	Units	RPD	Percent Recovery	Control Limits RPD	Control Limits Percent Recovery	Lab Quals
QC Batch ID: BXL2125	Used client sample: N										
Non-Volatile Organic Carbon	DUP	1430583-03	ND	ND		mg/L			10		
	MS	1430583-03	ND	5.3990	5.0251	mg/L		107		80 - 120	
	MSD	1430583-03	ND	5.3749	5.0251	mg/L	0.4	107	10	80 - 120	
QC Batch ID: BXL2262	Used client sample: Y - Description: RTH #5 - 122114, 12/21/2014 14:30										
Dissolved Calcium	DUP	**1430572-01**	**61.502**	**61.623**		**mg/L**	**0.2**		**20**		
	MS	**1430572-01**	**61.502**	**68.803**	**10.204**	**mg/L**		**71.5**		**85 - 115**	**A03**
	MSD	**1430572-01**	**61.502**	**69.333**	**10.204**	**mg/L**	**0.8**	**76.7**	**20**	**85 - 115**	**A03**
Dissolved Magnesium	DUP	1430572-01	21.775	21.690		mg/L	0.4		20		
	MS	1430572-01	21.775	30.631	10.204	mg/L		86.8		85 - 115	
	MSD	1430572-01	21.775	30.930	10.204	mg/L	1.0	89.7	20	85 - 115	
Dissolved Sodium	DUP	**1430572-01**	**49.712**	**49.424**		**mg/L**	**0.6**		**20**		
	MS	**1430572-01**	**49.712**	**57.000**	**10.204**	**mg/L**		**71.4**		**85 - 115**	**A03**
	MSD	**1430572-01**	**49.712**	**58.069**	**10.204**	**mg/L**	**1.9**	**81.9**	**20**	**85 - 115**	**A03**
Dissolved Potassium	DUP	1430572-01	6.2869	6.2787		mg/L	0.1		20		
	MS	1430572-01	6.2869	15.622	10.204	mg/L		91.5		85 - 115	
	MSD	1430572-01	6.2869	15.997	10.204	mg/L	2.4	95.2	20	85 - 115	
QC Batch ID: BXL2267	Used client sample: Y - Description: RTH #5 - 122114, 12/21/2014 14:30										
Chloride	DUP	1430572-01	25.687	25.710		mg/L	0.1		10		
	MS	1430572-01	25.687	82.508	50.505	mg/L		113		80 - 120	
	MSD	1430572-01	25.687	82.498	50.505	mg/L	0.0	112	10	80 - 120	
Nitrate as N	DUP	1430572-01	0.56900	0.56200		mg/L	1.2		10		
	MS	1430572-01	0.56900	5.7111	5.0505	mg/L		102		80 - 120	
	MSD	1430572-01	0.56900	5.7091	5.0505	mg/L	0.0	102	10	80 - 120	
Sulfate	DUP	1430572-01	92.207	92.440		mg/L	0.3		10		
	MS	1430572-01	92.207	206.65	101.01	mg/L		113		80 - 120	
	MSD	1430572-01	92.207	206.57	101.01	mg/L	0.0	113	10	80 - 120	
QC Batch ID: BXL2405	Used client sample: Y - Description: RTH #4 - 122214, 12/22/2014 09:05										
Total Dissolved Solids @ 180 C	DUP	1430572-02	5100.0	5120.0		mg/L	0.4		10		
QC Batch ID: BXL2456	Used client sample: Y - Description: RTH #5 - 122114, 12/21/2014 14:30										
Bicarbonate Alkalinity as CaCO3	DUP	1430572-01	215.12	215.27		mg/L	0.1		10		
Carbonate Alkalinity as CaCO3	DUP	1430572-01	ND	ND		mg/L			10		
pH	DUP	1430572-01	7.6900	7.6900		pH Units	0		20		
Electrical Conductivity @ 25 C	DUP	1430572-01	623.50	632.10		umhos/cm	1.4		10		
QC Batch ID: BXL2791	Used client sample: Y - Description: RTH #5 - 122114, 12/21/2014 14:30										

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303 Second Street, Suite 300
San Francisco, CA 94107

Reported: 01/05/2015 17:11
Project: Race Track Hill
Project Number: 1365027.00
Project Manager: Stuart Childs

Water Analysis (General Chemistry)

Quality Control Report - Precision & Accuracy

QC Batch ID: BXL2791 Used client sample: Y - Description: RTH #5 - 122114, 12/21/2014 14:30

Constituent	Type	Source Sample ID	Source Result	Result	Spike Added	Units	RPD	Percent Recovery	Control Limits RPD	Control Limits Percent Recovery	Lab Quals
Total Recoverable Calcium	DUP	**1430572-01**	**63.986**	**63.890**		**mg/L**	**0.1**		**20**		
	MS	**1430572-01**	**63.986**	**70.525**	**10.000**	**mg/L**		**65.4**		**75 - 125**	**A03**
	MSD	**1430572-01**	**63.986**	**73.377**	**10.000**	**mg/L**	**4.0**	**93.9**	**20**	**75 - 125**	
Total Recoverable Magnesium	DUP	1430572-01	22.926	22.876		mg/L	0.2		20		
	MS	1430572-01	22.926	31.913	10.000	mg/L		89.9		75 - 125	
	MSD	1430572-01	22.926	32.989	10.000	mg/L	3.3	101	20	75 - 125	
Total Recoverable Sodium	DUP	1430572-01	51.368	51.063		mg/L	0.6		20		
	MS	1430572-01	51.368	58.987	10.000	mg/L		76.2		75 - 125	
	MSD	1430572-01	51.368	61.380	10.000	mg/L	4.0	100	20	75 - 125	
Total Recoverable Potassium	DUP	1430572-01	6.4494	6.3864		mg/L	1.0		20		
	MS	1430572-01	6.4494	16.206	10.000	mg/L		97.6		75 - 125	
	MSD	1430572-01	6.4494	16.614	10.000	mg/L	2.5	102	20	75 - 125	

Kennedy/Jenks Consultants	Reported:	01/05/2015 17:11
303 Second Street, Suite 300	Project:	Race Track Hill
San Francisco, CA 94107	Project Number:	1365027.00
	Project Manager:	Stuart Childs

Metals Analysis

Quality Control Report - Method Blank Analysis

Constituent	QC Sample ID	MB Result	Units	PQL	MDL	Lab Quals
QC Batch ID: BXL2262						
Dissolved Boron	BXL2262-BLK1	ND	ug/L	100	10	
QC Batch ID: BXL2791						
Total Recoverable Boron	BXL2791-BLK1	ND	ug/L	100	10	

Kennedy/Jenks Consultants
303 Second Street, Suite 300
San Francisco, CA 94107

Reported: 01/05/2015 17:11
Project: Race Track Hill
Project Number: 1365027.00
Project Manager: Stuart Childs

Metals Analysis

Quality Control Report - Laboratory Control Sample

Constituent	QC Sample ID	Type	Result	Spike Level	Units	Percent Recovery	RPD	Control Limits Percent Recovery	Control Limits RPD	Lab Quals
QC Batch ID: BXL2262										
Dissolved Boron	BXL2262-BS1	LCS	982.54	1000.0	ug/L	98.3		85 - 115		
QC Batch ID: BXL2791										
Total Recoverable Boron	BXL2791-BS1	LCS	1021.5	1000.0	ug/L	102		85 - 115		

Kennedy/Jenks Consultants	**Reported:**	01/05/2015 17:11
303 Second Street, Suite 300	Project:	Race Track Hill
San Francisco, CA 94107	Project Number:	1365027.00
	Project Manager:	Stuart Childs

Metals Analysis

Quality Control Report - Precision & Accuracy

Constituent	Type	Source Sample ID	Source Result	Result	Spike Added	Units	RPD	Percent Recovery	Control Limits RPD	Control Limits Percent Recovery	Lab Quals
QC Batch ID: BXL2262	Used client sample: Y - Description: RTH #5 - 122114, 12/21/2014 14:30										
Dissolved Boron	DUP	1430572-01	69.031	69.465		ug/L	0.6		20		J
	MS	1430572-01	69.031	1029.9	1020.4	ug/L		94.2		85 - 115	
	MSD	1430572-01	69.031	1076.7	1020.4	ug/L	4.4	98.7	20	85 - 115	
QC Batch ID: BXL2791	Used client sample: Y - Description: RTH #5 - 122114, 12/21/2014 14:30										
Total Recoverable Boron	DUP	1430572-01	66.183	65.663		ug/L	0.8		20		J
	MS	1430572-01	66.183	1064.4	1000.0	ug/L		99.8		75 - 125	
	MSD	1430572-01	66.183	1093.1	1000.0	ug/L	2.7	103	20	75 - 125	

Kennedy/Jenks Consultants	**Reported:** 01/05/2015 17:11
303 Second Street, Suite 300	Project: Race Track Hill
San Francisco, CA 94107	Project Number: 1365027.00
	Project Manager: Stuart Childs

Notes And Definitions

J	Estimated Value (CLP Flag)
MDL	Method Detection Limit
ND	Analyte Not Detected at or above the reporting limit
PQL	Practical Quantitation Limit
RPD	Relative Percent Difference
A01	PQL's and MDL's are raised due to sample dilution.
A03	The sample concentration is more than 4 times the spike level.
A10	PQL's and MDL's were raised due to matrix interference.
S05	The sample holding time was exceeded.

Date of Report: 01/07/2015

Stuart Childs

Kennedy/Jenks Consultants
303 Second Street, Suite 300
San Francisco, CA 94107

Client Project:	1365027*00
BCL Project:	Race Track Hill
BCL Work Order:	1430662
Invoice ID:	B192806

Enclosed are the results of analyses for samples received by the laboratory on 12/23/2014. If you have any questions concerning this report, please feel free to contact me.

Sincerely,

Contact Person: Misty Orton
Client Service Rep

Authorized Signature

Table of Contents

BC Laboratories, Inc.

Chain of Custody Form

Page 1 of 1

Report To:
Client: Kennedy Jenks
Attn: Mike McLeod
Street Address: 303 Second St
City, State, Zip: San Francisco, CA
Phone: 415 243-2508 Fax: 415 896-0999
Email Address:
Work Order #: 14-30662

Project #: 136502 7*00
Project Name: Race Track Hill
Sampler(s): R. Prince

Analysis Requested

Please refer to the back of this page for completion instructions and method legend.

Sample #	Description	Date Sampled	Time Sampled	Total Metals	Dissolved metals (Field Filtered)	pH, TDS, SO4, NO3, Cl	Alk, CO3, HCO3	TPH Crude Oil	Total Organic Carbon	Soil	Sludge	Drinking Water	Ground Water	Waste Water	Other	Turnaround # of work days*	Notes
-1	RTH#6-122314	12/23/14	0830	X	X	X	→	X	X					X			
-2	RTH#3-122314	12/23/14	1000	X	X	X	→	X	X					X			

Comments: See attached list for complete analysis. Dissolved metals were field filtered.

Are there any tests with holding times less than or equal to 48 hours? ☒ Yes ☐ No

* Standard Turnaround = 10 work days

CHK BY / DISTRIBUTION
SUB-OUT ☐

SHORT HOLDING TIME
Cr^{+6} NO_2 NO_3 OP SS
DO Cl_2 BOD MBAS COT

Billing ☒ Same as above
Client:
Address:
City: State Zip
Attn:
PO#:

EDF Required? Geotracker ☐ Yes ☐ No
Send Copy to State of CA? (EDT) ☐ Yes ☐ No

Global ID (Needed for EDF)
System # (Needed for EDT)

	Date	Time		Date	Time
1. Relinquished By [signature]	12/23/14		1. Received By [signature]	12/23/14	1125
2. Relinquished By			2. Received By		
3. Relinquished By			3. Received By		

BC Laboratories, Inc. – 4100 Atlas Ct. – Bakersfield, CA 93308 – 661.327.4911 – Fax: 661.327.1918 – www.bclabs.com

Kennedy/Jenks Consultants

Table 1: Groundwater Sample Test Methods

14-3O0662

Constituent	Test Method[a]	Reporting Limit	Container[b]	Sample Volume[c]	Preservative[d]	Holding Time[e]
pH	SM4500-HB	0.1 unit	P	250 ml	None	24 hours
Electroconductivity (EC)	EPA 120.1	1 (µmhos/cm[f] @ 25°C)	P	250 ml	None	28 days
Nitrate - Nitrogen (NO_3 as N)	EPA 300.0	0.1 mg/l[g]	P	250 ml	None	48 hours
Total Dissolved Solids (TDS)	SM2540C	10 mg/l	P	250 ml	None	7 days
Total Organic Carbon (TOC)	EPA 415.3	1.0 mg/l	P	250 ml	H_2SO_4 pH<2	28 days
Boron (B)	EPA 200.7	0.1 mg/l	P	250 ml	HNO_3 pH<2	6 months
Chloride (Cl)	EPA 300.0	0.2 mg/l	P	250 ml	None	28 days
Calcium (Ca)	EPA 200.7	0.5 mg/l	P	250 ml	HNO_3 pH<2	6 months
Magnesium (Mg)	EPA 200.7	0.5 mg/l	P	250 ml	HNO_3 pH<2	6 months
Sodium (Na)	EPA 200.7	0.5 mg/l	P	250 ml	HNO_3 pH<2	6 months
Potassium (K)	EPA 200.7	0.5 mg/l	P	250 ml	HNO_3 pH<2	6 months
Sulfate (SO_4)	EPA 300.0	5.0 mg/l	P	250 ml	None	28 days
Alkalinity as Carbonate (CO_3)	EPA 310.1	1.0 mg/l	P	250 ml	None	14 days
Alkalinity as Bicarbonate (HCO_3)	EPA 310.1	1.0 mg/l	P	250 ml	None	14 days
TPH-Crude Oil (TPHc)	EPA 8015B	0.1 mg/l	G	1000 ml	None	14 days
Oxygen Isotopes	CRDS[h]	n/a	G	40 ml	None	1-3 months
Hydrogen Isotopes	CRDS	n/a	G	10 ml	None	1-3 months

Notes:

(a) EPA = U.S. Environmental Protection Agency
SM = Standard Methods
(b) P = Polyethylene; G = Glass
(c) ml = milliliter
(d) H_2SO_4 pH<2 = sulfuric acid at pH 2 or less; HNO_3 pH<2 = nitric acid at pH 2 or less
(e) All samples should be kept at 4 degrees Celsius from the time of collection until analysis.
(f) µmho/cm = micromhos per centimeter
(g) mg/l = milligrams per liter
(h) Cavity Ring-Down Spectrometer

Phase 2 Investigation Work Plan, Race Track Hill Area
Valley Water Management Company, Edison Oil Field, California Page 1 of 1
G:\IS-Group\Admin\Job\13\1385027.00_VWMC\09-Reports\Ph2-Investigation-WPlan\Tables\Table 01 Water Test Methods_mrw.docm

BC LABORATORIES INC. COOLER RECEIPT FORM Rev. No. 18 09/04/14 Page 1 Of 1

Submission #: 14-30662

SHIPPING INFORMATION
Federal Express ☐ UPS ☐ Hand Delivery ☑
BC Lab Field Service ☐ Other ☐ (Specify)______

SHIPPING CONTAINER
Ice Chest ☑ None ☐ Box ☐
Other ☐ (Specify)______

FREE LIQUID
YES ☐ NO ☐

Refrigerant: Ice ☑ Blue Ice ☐ None ☐ Other ☐ Comments:

Custody Seals Ice Chest ☐ Intact? Yes ☐ No ☐ Containers ☐ Intact? Yes ☐ No ☐ None ☑ Comments:

All samples received? Yes ☑ No ☐ All samples containers intact? Yes ☑ No ☐ Description(s) match COC? Yes ☑ No ☐

COC Received ☑ YES ☐ NO

Emissivity: 0.98 Container: PE Thermometer ID: 203 Date/Time 122314

Temperature: (A) 5.2 °C / (C) 4.8 °C Analyst Init MB 1125

SAMPLE CONTAINERS	1	2	3	4	5	6	7	8	9	10
QT GENERAL MINERAL/ GENERAL	D,E	D,E								
PT PE UNPRESERVED										
QT INORGANIC CHEMICAL METALS										
PT INORGANIC CHEMICAL METALS	B,C	B,C								
PT CYANIDE										
PT NITROGEN FORMS										
PT TOTAL SULFIDE										
2oz. NITRATE / NITRITE										
PT TOTAL ORGANIC CARBON	A	A								
PT TOX										
PT CHEMICAL OXYGEN DEMAND										
PtA PHENOLICS										
40ml VOA VIAL TRAVEL BLANK										
40ml VOA VIAL										
QT EPA 413.1, 413.2, 418.1										
PT ODOR										
RADIOLOGICAL										
BACTERIOLOGICAL										
40 ml VOA VIAL- 504										
QT EPA 508/608/8080										
QT EPA 515.1/8150										
QT EPA 525										
QT EPA 525 TRAVEL BLANK										
40ml EPA 547										
40ml EPA 531.1										
8oz Amber EPA 548										
QT EPA 549										
QT EPA 632										
QT EPA 8015M	F	F								
QT AMBER										
8 OZ. JAR										
32 OZ. JAR										
SOIL SLEEVE										
PCB VIAL										
PLASTIC BAG										
FERROUS IRON										
ENCORE										
SMART KIT										
Summa Canister										

Comments:______
Sample Numbering Completed By: CW Date/Time: 12/23/14 1208 [S:\WPDoc\WordPerfect\LAB_DOCS\FORMS\SAMREC]
A = Actual / C = Corrected

Kennedy/Jenks Consultants		**Reported:**	01/07/2015 15:06
303 Second Street, Suite 300		Project:	Race Track Hill
San Francisco, CA 94107		Project Number:	1365027*00
		Project Manager:	Stuart Childs

Laboratory / Client Sample Cross Reference

Laboratory	Client Sample Information			
1430662-01	**COC Number:**	---	**Receive Date:**	12/23/2014 11:25
	Project Number:	---	**Sampling Date:**	12/23/2014 08:30
	Sampling Location:	---	**Sample Depth:**	---
	Sampling Point:	RTH #6 - 122314	**Lab Matrix:**	Water
	Sampled By:	R. Prince	**Sample Type:**	Wastewater
			Metal Analysis: 1-Field Filtered and Acidified	
1430662-02	**COC Number:**	---	**Receive Date:**	12/23/2014 11:25
	Project Number:	---	**Sampling Date:**	12/23/2014 10:00
	Sampling Location:	---	**Sample Depth:**	---
	Sampling Point:	RTH #3 - 122314	**Lab Matrix:**	Water
	Sampled By:	R. Prince	**Sample Type:**	Wastewater
			Metal Analysis: 1-Field Filtered and Acidified	

Kennedy/Jenks Consultants		**Reported:**	01/07/2015 15:06
303 Second Street, Suite 300		Project:	Race Track Hill
San Francisco, CA 94107		Project Number:	1365027*00
		Project Manager:	Stuart Childs

Total Petroleum Hydrocarbons

BCL Sample ID: 1430662-01 **Client Sample Name:** RTH #6 - 122314, 12/23/2014 8:30:00AM, R. Prince

Constituent	Result	Units	PQL	MDL	Method	MB Bias	Lab Quals	Run #
TPH - Crude Oil	ND	ug/L	500	140	EPA-8015B/FFP	ND		1
Tetracosane (Surrogate)	81.3	%	37 - 134 (LCL - UCL)		EPA-8015B/FFP			1

Run #	Method	Prep Date	Run Date/Time	Analyst	Instrument	Dilution	QC Batch ID
1	EPA-8015B/FFP	12/26/14	12/27/14 01:06	MWB	GC-2	1	BXL2442

Kennedy/Jenks Consultants	**Reported:** 01/07/2015 15:06
303 Second Street, Suite 300	Project: Race Track Hill
San Francisco, CA 94107	Project Number: 1365027*00
	Project Manager: Stuart Childs

Water Analysis (General Chemistry)

BCL Sample ID: 1430662-01 **Client Sample Name:** RTH #6 - 122314, 12/23/2014 8:30:00AM, R. Prince

Constituent	Result	Units	PQL	MDL	Method	MB Bias	Lab Quals	Run #
Dissolved Calcium	**390**	**mg/L**	**0.10**	**0.016**	**EPA-200.7**	ND		1
Total Recoverable Calcium	**400**	**mg/L**	**0.10**	**0.014**	**EPA-200.7**	ND		2
Dissolved Magnesium	**48**	**mg/L**	**0.050**	**0.019**	**EPA-200.7**	ND		1
Total Recoverable Magnesium	**48**	**mg/L**	**0.050**	**0.019**	**EPA-200.7**	ND		2
Dissolved Sodium	**560**	**mg/L**	**0.50**	**0.051**	**EPA-200.7**	ND		1
Total Recoverable Sodium	**570**	**mg/L**	**0.50**	**0.051**	**EPA-200.7**	ND		2
Dissolved Potassium	**21**	**mg/L**	**1.0**	**0.10**	**EPA-200.7**	ND		1
Total Recoverable Potassium	**22**	**mg/L**	**1.0**	**0.10**	**EPA-200.7**	ND		2
Bicarbonate Alkalinity as CaCO3	**190**	**mg/L**	**8.2**	**8.2**	**EPA-310.1**	ND		3
Carbonate Alkalinity as CaCO3	ND	mg/L	8.2	8.2	EPA-310.1	ND		3
Alkalinity as CaCO3	**190**	**mg/L**	**4.1**	**4.1**	**Calc**	ND		4
Chloride	**1300**	**mg/L**	**5.0**	**0.61**	**EPA-300.0**	ND	**A01**	5
Nitrate as N	**23**	**mg/L**	**1.0**	**0.18**	**EPA-300.0**	ND	**A01**	5
Sulfate	**290**	**mg/L**	**10**	**1.0**	**EPA-300.0**	ND	**A01**	5
pH	**7.34**	**pH Units**	**0.05**	**0.05**	**EPA-150.1**		**S05**	6
Electrical Conductivity @ 25 C	**4680**	**umhos/cm**	**1.00**	**1.00**	**EPA-120.1**			7
Total Dissolved Solids @ 180 C	**3500**	**mg/L**	**200**	**200**	**SM-2540C**	ND		8
Non-Volatile Organic Carbon	**1.2**	**mg/L**	**1.0**	**0.30**	**EPA-415.1**	ND		9

Run #	Method	Prep Date	Run Date/Time	Analyst	Instrument	Dilution	QC Batch ID
1	EPA-200.7	12/23/14	12/30/14 14:50	JRG	PE-OP2	1	BXL2640
2	EPA-200.7	12/31/14	12/31/14 17:44	JRG	PE-OP2	1	BXL2791
3	EPA-310.1	12/26/14	12/26/14 14:46	RML	MET-1	2	BXL2457
4	Calc	12/24/14	01/05/15 07:55	MSA	Calc	1	BXL2326
5	EPA-300.0	12/23/14	12/24/14 07:46	OLH	IC1	10	BXL2337
6	EPA-150.1	12/26/14	12/26/14 14:46	RML	MET-1	1	BXL2457
7	EPA-120.1	12/26/14	12/26/14 14:46	RML	MET-1	1	BXL2457
8	SM-2540C	12/29/14	12/29/14 08:30	CAD	MANUAL	20	BXL2533
9	EPA-415.1	12/24/14	12/24/14 15:08	ALW	TOC2	1	BXL2180

Kennedy/Jenks Consultants	**Reported:** 01/07/2015 15:06
303 Second Street, Suite 300	Project: Race Track Hill
San Francisco, CA 94107	Project Number: 1365027*00
	Project Manager: Stuart Childs

Metals Analysis

BCL Sample ID: 1430662-01 **Client Sample Name:** RTH #6 - 122314, 12/23/2014 8:30:00AM, R. Prince

Constituent	Result	Units	PQL	MDL	Method	MB Bias	Lab Quals	Run #
Dissolved Boron	**2900**	**ug/L**	**100**	**10**	**EPA-200.7**	ND		1
Total Recoverable Boron	**3000**	**ug/L**	**100**	**10**	**EPA-200.7**	ND		2

Run #	Method	Prep Date	Run Date/Time	Analyst	Instrument	Dilution	QC Batch ID
1	EPA-200.7	12/23/14	12/30/14 14:50	JRG	PE-OP2	1	BXL2640
2	EPA-200.7	12/31/14	12/31/14 17:44	JRG	PE-OP2	1	BXL2791

Kennedy/Jenks Consultants 303 Second Street, Suite 300 San Francisco, CA 94107	**Reported:** 01/07/2015 15:06 Project: Race Track Hill Project Number: 1365027*00 Project Manager: Stuart Childs

Total Petroleum Hydrocarbons

BCL Sample ID: 1430662-02 **Client Sample Name:** RTH #3 - 122314, 12/23/2014 10:00:00AM, R. Prince

Constituent	Result	Units	PQL	MDL	Method	MB Bias	Lab Quals	Run #
TPH - Crude Oil	ND	ug/L	500	140	EPA-8015B/FFP	ND		1
Tetracosane (Surrogate)	75.5	%	37 - 134 (LCL - UCL)		EPA-8015B/FFP			1

Run #	Method	Prep Date	Run Date/Time	Analyst	Instrument	Dilution	QC Batch ID
1	EPA-8015B/FFP	12/26/14	12/27/14 01:29	MWB	GC-2	1	BXL2442

Kennedy/Jenks Consultants	**Reported:** 01/07/2015 15:06
303 Second Street, Suite 300	Project: Race Track Hill
San Francisco, CA 94107	Project Number: 1365027*00
	Project Manager: Stuart Childs

Water Analysis (General Chemistry)

BCL Sample ID: 1430662-02 **Client Sample Name:** RTH #3 - 122314, 12/23/2014 10:00:00AM, R. Prince

Constituent	Result	Units	PQL	MDL	Method	MB Bias	Lab Quals	Run #
Dissolved Calcium	**170**	**mg/L**	**0.10**	**0.016**	**EPA-200.7**	ND		1
Total Recoverable Calcium	**170**	**mg/L**	**0.10**	**0.014**	**EPA-200.7**	ND		2
Dissolved Magnesium	**84**	**mg/L**	**0.050**	**0.019**	**EPA-200.7**	ND		1
Total Recoverable Magnesium	**81**	**mg/L**	**0.050**	**0.019**	**EPA-200.7**	ND		2
Dissolved Sodium	**190**	**mg/L**	**0.50**	**0.051**	**EPA-200.7**	ND		1
Total Recoverable Sodium	**180**	**mg/L**	**0.50**	**0.051**	**EPA-200.7**	ND		2
Dissolved Potassium	**22**	**mg/L**	**1.0**	**0.10**	**EPA-200.7**	ND		1
Total Recoverable Potassium	**22**	**mg/L**	**1.0**	**0.10**	**EPA-200.7**	ND		2
Bicarbonate Alkalinity as CaCO3	**100**	**mg/L**	**8.2**	**8.2**	**EPA-310.1**	ND		3
Carbonate Alkalinity as CaCO3	ND	mg/L	8.2	8.2	EPA-310.1	ND		3
Alkalinity as CaCO3	**100**	**mg/L**	**4.1**	**4.1**	**Calc**	ND		4
Chloride	**130**	**mg/L**	**1.0**	**0.12**	**EPA-300.0**	ND	**A01**	5
Nitrate as N	**0.16**	**mg/L**	**0.20**	**0.036**	**EPA-300.0**	ND	**J,A10**	5
Sulfate	**800**	**mg/L**	**2.0**	**0.20**	**EPA-300.0**	ND	**A01**	5
pH	**6.91**	**pH Units**	**0.05**	**0.05**	**EPA-150.1**		**S05**	6
Electrical Conductivity @ 25 C	**1920**	**umhos/cm**	**1.00**	**1.00**	**EPA-120.1**			7
Total Dissolved Solids @ 180 C	**1500**	**mg/L**	**50**	**50**	**SM-2540C**	ND		8
Non-Volatile Organic Carbon	**3.4**	**mg/L**	**1.0**	**0.30**	**EPA-415.1**	ND		9

Run #	Method	Prep Date	Run Date/Time	Analyst	Instrument	Dilution	QC Batch ID
1	EPA-200.7	12/23/14	12/30/14 15:03	JRG	PE-OP2	1	BXL2640
2	EPA-200.7	12/31/14	12/31/14 17:52	JRG	PE-OP2	1	BXL2791
3	EPA-310.1	12/26/14	12/26/14 14:59	RML	MET-1	2	BXL2457
4	Calc	12/24/14	01/05/15 07:55	MSA	Calc	1	BXL2326
5	EPA-300.0	12/23/14	12/24/14 08:01	OLH	IC1	2	BXL2337
6	EPA-150.1	12/26/14	12/26/14 14:59	RML	MET-1	1	BXL2457
7	EPA-120.1	12/26/14	12/26/14 14:59	RML	MET-1	1	BXL2457
8	SM-2540C	12/29/14	12/29/14 08:30	CAD	MANUAL	5	BXL2533
9	EPA-415.1	12/24/14	12/24/14 15:23	ALW	TOC2	1	BXL2180

Kennedy/Jenks Consultants	**Reported:** 01/07/2015 15:06
303 Second Street, Suite 300	Project: Race Track Hill
San Francisco, CA 94107	Project Number: 1365027*00
	Project Manager: Stuart Childs

Metals Analysis

BCL Sample ID: 1430662-02 **Client Sample Name:** RTH #3 - 122314, 12/23/2014 10:00:00AM, R. Prince

Constituent	Result	Units	PQL	MDL	Method	MB Bias	Lab Quals	Run #
Dissolved Boron	**670**	**ug/L**	**100**	**10**	**EPA-200.7**	ND		1
Total Recoverable Boron	**650**	**ug/L**	**100**	**10**	**EPA-200.7**	ND		2

Run #	Method	Prep Date	Run Date/Time	Analyst	Instrument	Dilution	QC Batch ID
1	EPA-200.7	12/23/14	12/30/14 15:03	JRG	PE-OP2	1	BXL2640
2	EPA-200.7	12/31/14	12/31/14 17:52	JRG	PE-OP2	1	BXL2791

Kennedy/Jenks Consultants
303 Second Street, Suite 300
San Francisco, CA 94107

Reported: 01/07/2015 15:06
Project: Race Track Hill
Project Number: 1365027*00
Project Manager: Stuart Childs

Total Petroleum Hydrocarbons

Quality Control Report - Method Blank Analysis

Constituent	QC Sample ID	MB Result	Units	PQL	MDL	Lab Quals
QC Batch ID: BXL2442						
TPH - Diesel (FFP)	BXL2442-BLK1	ND	ug/L	200	34	
TPH - Crude Oil	BXL2442-BLK1	ND	ug/L	500	140	
Tetracosane (Surrogate)	**BXL2442-BLK1**	**73.3**	%	**37 - 134 (LCL - UCL)**		

Kennedy/Jenks Consultants	**Reported:**	01/07/2015 15:06
303 Second Street, Suite 300	Project:	Race Track Hill
San Francisco, CA 94107	Project Number:	1365027*00
	Project Manager:	Stuart Childs

Total Petroleum Hydrocarbons

Quality Control Report - Laboratory Control Sample

Constituent	QC Sample ID	Type	Result	Spike Level	Units	Percent Recovery	RPD	Control Limits Percent Recovery	Control Limits RPD	Lab Quals
QC Batch ID: BXL2442										
TPH - Diesel (FFP)	BXL2442-BS1	LCS	2003.0	2500.0	ug/L	80.1		52 - 128		
Tetracosane (Surrogate)	BXL2442-BS1	LCS	89.145	100.00	ug/L	89.1		37 - 134		

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Total Petroleum Hydrocarbons

Quality Control Report - Precision & Accuracy

									Control Limits		
Constituent	**Type**	**Source Sample ID**	**Source Result**	**Result**	**Spike Added**	**Units**	**RPD**	**Percent Recovery**	**RPD**	**Percent Recovery**	**Lab Quals**
QC Batch ID: BXL2442	Used client sample: N										
TPH - Diesel (FFP)	MS	1425343-78	ND	1879.8	2500.0	ug/L		75.2		50 - 127	
	MSD	1425343-78	ND	1647.1	2500.0	ug/L	13.2	65.9	24	50 - 127	
Tetracosane (Surrogate)	MS	1425343-78	ND	88.750	100.00	ug/L		88.8		37 - 134	
	MSD	1425343-78	ND	77.790	100.00	ug/L	13.2	77.8		37 - 134	

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Water Analysis (General Chemistry)

Quality Control Report - Method Blank Analysis

Constituent	QC Sample ID	MB Result	Units	PQL	MDL	Lab Quals
QC Batch ID: BXL2180						
Non-Volatile Organic Carbon	BXL2180-BLK1	ND	mg/L	1.0	0.30	
QC Batch ID: BXL2326						
Alkalinity as CaCO3	BXL2326-BLK1	ND	mg/L	4.1	4.1	
QC Batch ID: BXL2337						
Chloride	BXL2337-BLK1	ND	mg/L	0.50	0.061	
Nitrate as N	BXL2337-BLK1	ND	mg/L	0.10	0.018	
Sulfate	BXL2337-BLK1	ND	mg/L	1.0	0.10	
QC Batch ID: BXL2457						
Bicarbonate Alkalinity as CaCO3	BXL2457-BLK1	ND	mg/L	4.1	4.1	
Carbonate Alkalinity as CaCO3	BXL2457-BLK1	ND	mg/L	4.1	4.1	
QC Batch ID: BXL2533						
Total Dissolved Solids @ 180 C	BXL2533-BLK1	ND	mg/L	6.7	6.7	
QC Batch ID: BXL2640						
Dissolved Calcium	BXL2640-BLK1	ND	mg/L	0.10	0.016	
Dissolved Magnesium	BXL2640-BLK1	ND	mg/L	0.050	0.019	
Dissolved Sodium	BXL2640-BLK1	ND	mg/L	0.50	0.051	
Dissolved Potassium	BXL2640-BLK1	ND	mg/L	1.0	0.10	
QC Batch ID: BXL2791						
Total Recoverable Calcium	BXL2791-BLK1	ND	mg/L	0.10	0.014	
Total Recoverable Magnesium	BXL2791-BLK1	ND	mg/L	0.050	0.019	
Total Recoverable Sodium	BXL2791-BLK1	ND	mg/L	0.50	0.051	
Total Recoverable Potassium	BXL2791-BLK1	ND	mg/L	1.0	0.10	

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	Project Manager:	Stuart Childs

Water Analysis (General Chemistry)

Quality Control Report - Laboratory Control Sample

Constituent	QC Sample ID	Type	Result	Spike Level	Units	Percent Recovery	RPD	Control Limits Percent Recovery	Control Limits RPD	Lab Quals
QC Batch ID: BXL2180										
Non-Volatile Organic Carbon	BXL2180-BS1	LCS	5.3160	5.0000	mg/L	106		85 - 115		
QC Batch ID: BXL2337										
Chloride	BXL2337-BS1	LCS	50.382	50.000	mg/L	101		90 - 110		
Nitrate as N	BXL2337-BS1	LCS	4.6270	5.0000	mg/L	92.5		90 - 110		
Sulfate	BXL2337-BS1	LCS	100.92	100.00	mg/L	101		90 - 110		
QC Batch ID: BXL2457										
pH	BXL2457-BS2	LCS	7.0500	7.0000	pH Units	101		95 - 105		
Electrical Conductivity @ 25 C	BXL2457-BS1	LCS	300.70	303.00	umhos/cm	99.2		90 - 110		
QC Batch ID: BXL2533										
Total Dissolved Solids @ 180 C	BXL2533-BS1	LCS	555.00	586.00	mg/L	94.7		90 - 110		
QC Batch ID: BXL2640										
Dissolved Calcium	BXL2640-BS1	LCS	10.163	10.000	mg/L	102		85 - 115		
Dissolved Magnesium	BXL2640-BS1	LCS	10.894	10.000	mg/L	109		85 - 115		
Dissolved Sodium	BXL2640-BS1	LCS	10.259	10.000	mg/L	103		85 - 115		
Dissolved Potassium	BXL2640-BS1	LCS	9.9429	10.000	mg/L	99.4		85 - 115		
QC Batch ID: BXL2791										
Total Recoverable Calcium	BXL2791-BS1	LCS	10.334	10.000	mg/L	103		85 - 115		
Total Recoverable Magnesium	BXL2791-BS1	LCS	10.807	10.000	mg/L	108		85 - 115		
Total Recoverable Sodium	BXL2791-BS1	LCS	10.498	10.000	mg/L	105		85 - 115		
Total Recoverable Potassium	BXL2791-BS1	LCS	10.153	10.000	mg/L	102		85 - 115		

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Water Analysis (General Chemistry)

Quality Control Report - Precision & Accuracy

Constituent	Type	Source Sample ID	Source Result	Result	Spike Added	Units	RPD	Percent Recovery	Control Limits RPD	Control Limits Percent Recovery	Lab Quals
QC Batch ID: BXL2180	Used client sample: N										
Non-Volatile Organic Carbon	DUP	**1430634-01**	**0.66800**	**0.47500**		**mg/L**	**33.8**		**10**		**J,A02**
	MS	**1430634-01**	**0.66800**	**5.8342**	**5.0251**	**mg/L**		**103**		**80 - 120**	
	MSD	**1430634-01**	**0.66800**	**5.8090**	**5.0251**	**mg/L**	**0.4**	**102**	**10**	**80 - 120**	
QC Batch ID: BXL2337	Used client sample: N										
Chloride	DUP	1430644-01	70.307	70.417		mg/L	0.2		10		
	MS	1430644-01	70.307	125.07	50.505	mg/L		108		80 - 120	
	MSD	1430644-01	70.307	124.94	50.505	mg/L	0.1	108	10	80 - 120	
Nitrate as N	DUP	1430644-01	6.8030	6.8400		mg/L	0.5		10		
	MS	1430644-01	6.8030	12.140	5.0505	mg/L		106		80 - 120	
	MSD	1430644-01	6.8030	12.061	5.0505	mg/L	0.7	104	10	80 - 120	
Sulfate	DUP	1430644-01	218.71	218.85		mg/L	0.1		10		
	MS	1430644-01	218.71	324.10	101.01	mg/L		104		80 - 120	
	MSD	1430644-01	218.71	323.85	101.01	mg/L	0.1	104	10	80 - 120	
QC Batch ID: BXL2457	Used client sample: Y - Description: RTH #6 - 122314, 12/23/2014 08:30										
Bicarbonate Alkalinity as CaCO3	DUP	1430662-01	188.95	189.86		mg/L	0.5		10		
Carbonate Alkalinity as CaCO3	DUP	1430662-01	ND	ND		mg/L			10		
pH	DUP	1430662-01	7.3400	7.3500		pH Units	0.1		20		
Electrical Conductivity @ 25 C	DUP	1430662-01	4676.7	4557.1		umhos/cm	2.6		10		
QC Batch ID: BXL2533	Used client sample: Y - Description: RTH #6 - 122314, 12/23/2014 08:30										
Total Dissolved Solids @ 180 C	DUP	1430662-01	3520.0	3600.0		mg/L	2.2		10		
QC Batch ID: BXL2640	Used client sample: Y - Description: RTH #6 - 122314, 12/23/2014 08:30										
Dissolved Calcium	DUP	**1430662-01**	**388.52**	**390.55**		**mg/L**	**0.5**		**20**		
	MS	**1430662-01**	**388.52**	**392.25**	**10.204**	**mg/L**		**36.5**		**85 - 115**	**A03**
	MSD	**1430662-01**	**388.52**	**391.32**	**10.204**	**mg/L**	**0.2**	**27.4**	**20**	**85 - 115**	**A03**
Dissolved Magnesium	DUP	1430662-01	47.934	47.971		mg/L	0.1		20		
	MS	1430662-01	47.934	57.247	10.204	mg/L		91.3		85 - 115	
	MSD	1430662-01	47.934	57.746	10.204	mg/L	0.9	96.2	20	85 - 115	
Dissolved Sodium	DUP	**1430662-01**	**563.18**	**567.66**		**mg/L**	**0.8**		**20**		
	MS	**1430662-01**	**563.18**	**559.21**	**10.204**	**mg/L**		**-38.9**		**85 - 115**	**A03**
	MSD	**1430662-01**	**563.18**	**564.55**	**10.204**	**mg/L**	**1.0**	**13.4**	**20**	**85 - 115**	**A03**
Dissolved Potassium	DUP	1430662-01	21.213	21.253		mg/L	0.2		20		
	MS	1430662-01	21.213	31.191	10.204	mg/L		97.8		85 - 115	
	MSD	1430662-01	21.213	31.577	10.204	mg/L	1.2	102	20	85 - 115	
QC Batch ID: BXL2791	Used client sample: Y - Description: RTH #5 - 122114, 12/21/2014 14:30										

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	Project Manager:	Stuart Childs

Water Analysis (General Chemistry)

Quality Control Report - Precision & Accuracy

QC Batch ID: BXL2791 Used client sample: Y - Description: RTH #5 - 122114, 12/21/2014 14:30

Constituent	Type	Source Sample ID	Source Result	Result	Spike Added	Units	RPD	Percent Recovery	Control Limits RPD	Control Limits Percent Recovery	Lab Quals
Total Recoverable Calcium	DUP	**1430572-01**	**63.986**	**63.890**		**mg/L**	**0.1**		**20**		
	MS	**1430572-01**	**63.986**	**70.525**	**10.000**	**mg/L**		**65.4**		**75 - 125**	**A03**
	MSD	**1430572-01**	**63.986**	**73.377**	**10.000**	**mg/L**	**4.0**	**93.9**	**20**	**75 - 125**	
Total Recoverable Magnesium	DUP	1430572-01	22.926	22.876		mg/L	0.2		20		
	MS	1430572-01	22.926	31.913	10.000	mg/L		89.9		75 - 125	
	MSD	1430572-01	22.926	32.989	10.000	mg/L	3.3	101	20	75 - 125	
Total Recoverable Sodium	DUP	1430572-01	51.368	51.063		mg/L	0.6		20		
	MS	1430572-01	51.368	58.987	10.000	mg/L		76.2		75 - 125	
	MSD	1430572-01	51.368	61.380	10.000	mg/L	4.0	100	20	75 - 125	
Total Recoverable Potassium	DUP	1430572-01	6.4494	6.3864		mg/L	1.0		20		
	MS	1430572-01	6.4494	16.206	10.000	mg/L		97.6		75 - 125	
	MSD	1430572-01	6.4494	16.614	10.000	mg/L	2.5	102	20	75 - 125	

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	Project Manager: Stuart Childs

Metals Analysis

Quality Control Report - Method Blank Analysis

Constituent	QC Sample ID	MB Result	Units	PQL	MDL	Lab Quals
QC Batch ID: BXL2640						
Dissolved Boron	BXL2640-BLK1	ND	ug/L	100	10	
QC Batch ID: BXL2791						
Total Recoverable Boron	BXL2791-BLK1	ND	ug/L	100	10	

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Metals Analysis

Quality Control Report - Laboratory Control Sample

Constituent	QC Sample ID	Type	Result	Spike Level	Units	Percent Recovery	RPD	Control Limits Percent Recovery	Control Limits RPD	Lab Quals
QC Batch ID: BXL2640										
Dissolved Boron	BXL2640-BS1	LCS	1001.3	1000.0	ug/L	100		85 - 115		
QC Batch ID: BXL2791										
Total Recoverable Boron	BXL2791-BS1	LCS	1021.5	1000.0	ug/L	102		85 - 115		

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Metals Analysis

Quality Control Report - Precision & Accuracy

Constituent	Type	Source Sample ID	Source Result	Result	Spike Added	Units	RPD	Percent Recovery	Control Limits RPD	Control Limits Percent Recovery	Lab Quals
QC Batch ID: BXL2640	Used client sample: Y - Description: RTH #6 - 122314, 12/23/2014 08:30										
Dissolved Boron	DUP	1430662-01	2880.9	2866.2		ug/L	0.5		20		
	MS	1430662-01	2880.9	3922.7	1020.4	ug/L		102		85 - 115	
	MSD	1430662-01	2880.9	3897.5	1020.4	ug/L	0.6	99.6	20	85 - 115	
QC Batch ID: BXL2791	Used client sample: Y - Description: RTH #5 - 122114, 12/21/2014 14:30										
Total Recoverable Boron	DUP	1430572-01	66.183	65.663		ug/L	0.8		20		J
	MS	1430572-01	66.183	1064.4	1000.0	ug/L		99.8		75 - 125	
	MSD	1430572-01	66.183	1093.1	1000.0	ug/L	2.7	103	20	75 - 125	

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		Project Manager:	Stuart Childs

Notes And Definitions

J	Estimated Value (CLP Flag)
MDL	Method Detection Limit
ND	Analyte Not Detected at or above the reporting limit
PQL	Practical Quantitation Limit
RPD	Relative Percent Difference
A01	PQL's and MDL's are raised due to sample dilution.
A02	The difference between duplicate readings is less than the PQL.
A03	The sample concentration is more than 4 times the spike level.
A10	PQL's and MDL's were raised due to matrix interference.
S05	The sample holding time was exceeded.

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January 16, 2014

Mr. Mike McLeod
Kennedy Jenks Inc.
303 Second St.
San Francisco CA 94107
mikemcleod@kennedyjenks.com

REPORT OF ANALYSES
5 water samples for O and H isotopes,

W	Sample		$\delta^{18}O$ ‰	δD ‰
61248	RTH #5	-122114	-8.8	-64
61249	RTH #4	-122114	-6.8	-58
61250	RTH #1	-122114	-6.2	-54
61251	RTH #6	-122314	-5.8	-56
61252	RTH #3	-122314	-6.7	-60
Analytical precision, 1-sigma			0.08	0.9

C. J. Eastoe
C.J.Eastoe
Staff Scientist

Appendix C

Report on Installation of Deep Monitor Wells
at the Valley Water Management Company
Race Track Hill and Plant-C Facilities in Kern County

REPORT ON INSTALLATION OF DEEP MONITOR WELLS AT VALLEY WATER MANAGEMENT COMPANY RACETRACK HILL AND PLANT-C FACILITIES IN KERN COUNTY

prepared for
Dee Jaspar and Associates
Bakersfield, California

by
Kenneth D. Schmidt and Associates
Groundwater Quality Consultants
Bakersfield, California

June 2015

KENNETH D. SCHMIDT AND ASSOCIATES
GROUNDWATER QUALITY CONSULTANTS
3701 PEGASUS DRIVE, SUITE 112
BAKERSFIELD, CALIFORNIA 93308
TELEPHONE (661) 392-1630

June 24, 2015

Mr. Dee Jaspar
Dee Jaspar and Associates
2730 Unicorn Rd, Building A
Bakersfield, CA 93308-6843

Re: Deep Monitor Wells at Valley Water Management
Racetrack Hill and Plant-C Facilities

Dear Dee:

Submitted herewith is our report on the installation and initial testing of the deep monitor wells at the Valley Water Management Company Racetrack Hill and Plant-C Facilities in Kern County. We appreciate your assistance and the cooperation of Bradley & Sons of Del Rey in conducting this work.

Sincerely Yours,

Kenneth D. Schmidt
Geologist No. 1578
Certified Hydrogeologist
No. 176

KDS/td

TABLE OF CONTENTS

LIST OF TABLES

LIST OF ILLUSTRATIONS

REPORT ON INSTALLATION OF DEEP MONITOR WELLS AT VALLEY WATER MANAGEMENT COMPANY RACETRACK HILL AND PLANT-C FACILITIES IN KERN COUNTY

INTRODUCTION

In October 2014, Kenneth D. Schmidt and Associates (KDSA) provided a workplan for installation of deep monitor wells at Valley Water Management Company (VWM) Racetrack Hill and Plant-C Facilities. The wells were installed and developed during January-February, 2015, and the initial monitoring was completed in March 2015. Three deep monitor wells were installed, developed, and tested at the Racetrack Hill facility. All of those are located near wastewater ponds. The Racetrack Hill facility is located east of Bakersfield in part of Section 24, T29S/R29E. Figure 1 shows the location of the facility and the deep monitor wells (RTH-7D, RTH-8D, and RTH-9D). All of these wells were installed adjacent to a previously completed shallow monitor well (Kennedy/Jenks Consultants, 2015). RTH-7D was installed adjacent to RTH-6, RTH-8D was installed adjacent to RTH-4, and RTH-9D was installed adjacent to RTH-1.

One deep monitor well was installed, developed, and tested at the Plant-C facility. The Plant-C facility is located north of Edison near the southwest corner of Section 34, T29S/R29E. Figure 2 shows the location of this facility and the deep monitor well (C-1D), which is located southwest of a pond. A shallow well was

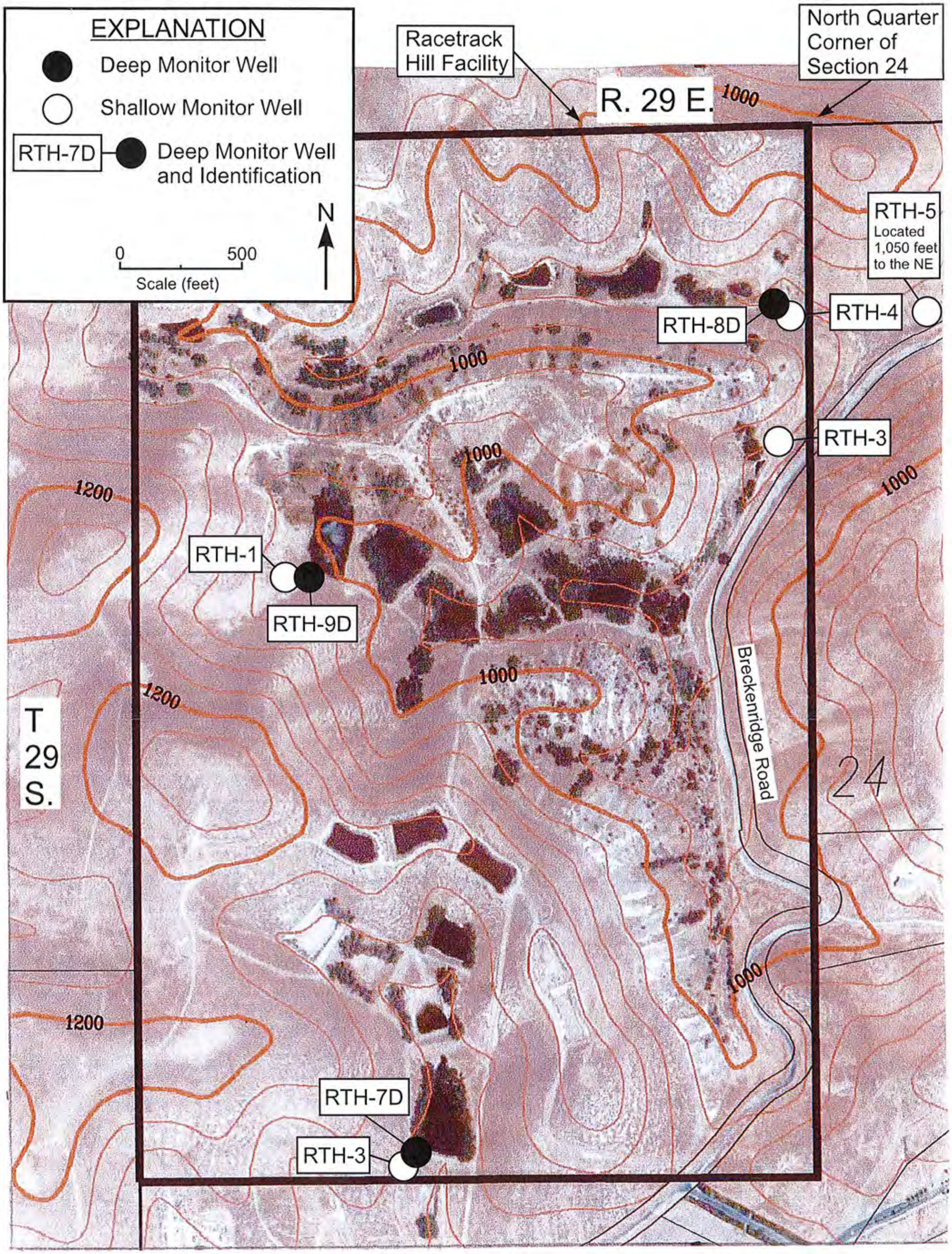

FIGURE 1 - LOCATION OF RACETRACK HILL FACILITY, AND SHALLOW AND DEEP MONITOR WELLS

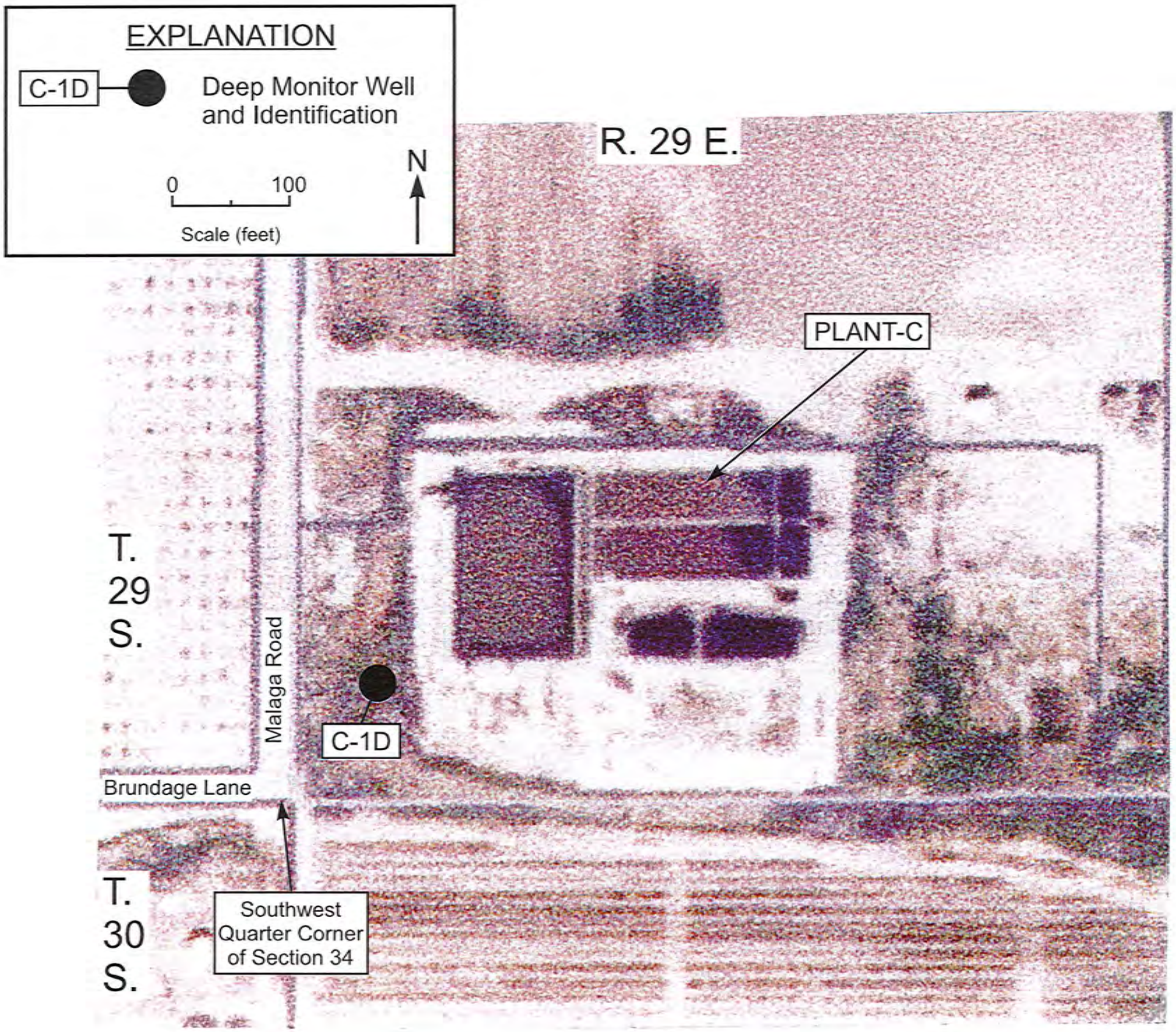

FIGURE 2 - LOCATION OF PLANT-C FACILITY AND DEEP MONITOR WELL

not previously installed at the Plant-C facility because of the great depth to water (exceeding 200 feet) that was documented by an exploratory boring.

WELL INSTALLATION

Bradley & Sons of Del Rey installed the deep monitor wells by the direct rotary method during January 26-February 24, 2015. An electric log and sonic log were run in the hole for each new monitor well (Attachment A). A geologic log for each monitor well is provided in Attachment B and a completion diagram for each well is provided in Attachment C.

At the Racetrack Hill facility, saturated deposits at the time of drilling were indicated below depths ranging from about 70 to 155 feet. At the Plant-C facility, saturated deposits were indicated below a depth of 270 feet. Deposits opposite the perforated intervals of the new wells were primarily alternating layers of sand, gravel, and sandy clay. A five-inch diameter Schedule 40 PVC casing was installed in a twelve-inch diameter hole for each deep well at the Racetrack Hill facility. At the Plant-C facility, a five-inch diameter Schedule 80 PVC casing was installed in a twelve-inch diameter hole. Flush joints and threaded ends were used and all joints for the casing were made using clean couplings. No glue or solvents were used in connecting the casing joints. Machine-cut 0.03-inch slot factory perforated was used for the perforated sections. Table 1 shows construction information for the deep monitor wells.

The tops of the perforations in the Racetrack Hill facility wells ranged from 191 to 312 feet in depth and the bottoms of the perforations ranged from are 210 to 350 feet in depth. The top of the perforations are 395 feet and the bottom of the perforations are 435 feet in depth at the Plant-C facility deep well. For all of the deep monitor wells, SRI 6x20 sand was used for the gravel packs, which were placed in the annular space from the bottom up to depths extending above the tops of the perforations. Four to six feet of bentonite were placed in the annular space above the tops of the gravel packs, and sand-cement grout was installed above the bentonite. The base of the annular seals in the deep wells ranged from 168 to 381 feet in depth and the seals extended up to the land surface. Completion reports for the wells are provided in Attachment D.

SUBSURFACE GEOLOGIC CO`NDITIONS

Racetrack Hill Facility

A subsurface geologic cross section was previously developed that extended through the western and northern parts of the facility. The shallowest deposits beneath the facility are part of the Kern River-Chanac Formation and are generally unconsolidated.

TABLE 1-CONSTRUCTION DATA FOR DEEP MONITOR WELLS

Well No.	Date Completed	Drilled Depth (feet)	Cased Depth (feet)	Perforated Int. (feet)	Gravel Pack feet)	Annular Seal (feet)
RTH-7D	2/11/15	360	330	282-330	223-340	0-223
RTH-8D	1/28/15	260	210	191-210	168-210	0-168
RTH-9D	2/17/15	360	350	312-350	289-360	0-289
C-1D	2/24/15	460	435	395-435	381-455	0-381

Monitor wells were constructed by Bradley & Sons of Del Rey and have 5-inch diameter PVC casings. Schedule 40 was used for the first three wells, and Schedule 80 for C-1D.

These alluvial deposits dip to the southwest beneath the facility. These deposits pinch out east of the facility and are indicated to be about 700 feet thick near the west edge of the facility. The next deeper deposits beneath the facility are the marine Santa Margarita Formation. These deposits are indicated to extend to a depth of about 800 feet near the northeast corner of the facility and to a depth of about 1,500 feet near the west edge of the facility. Beneath the Santa Margarita Formation is the Edison Shale, which is of low permeability and forms the base of the aquifer. Comparison of the logs for the deep monitor wells with the cross section indicates that RTH-8D encountered the top of the Santa Margarita Formation at a depth of about 140 feet. The other two deep monitor wells at the Racetrack Hill facility only encountered deposits of the Kern River-Chanac Formation.

Plant-C Facility

At the Plant-C facility, the top of the Santa Margarita Formation is more than 1,200 feet deep. Water supply wells in this area and the deep monitor well (C-1D) tap deposits of the overlying Kern River-Chanac Formation.

WELL DEVELOPMENT

Bradley & Sons developed the perforated intervals in each of the monitor wells by bailing with a bailer. On January 29, RTH-8D was for bailed for three hours and on February 12, RTH-7D was bailed for three hours. On February 18, RTH-9D was bailed five hours, and on February 25, C-1D was bailed six hours. After this preliminary development was completed, a submersible pump was installed in each of the wells, and development continued by pumping and surging until the water was clear. RTH-8D was pumped and surged for two hours on February 5, RTH-7D for four hours on February 13, RTH-9D for four hours on February 24, and C-1D for six hours on February 25-26. Pumping rates ranged from about 5 to 15 gpm.

WATER LEVELS

Table 2 provides water-level data for the deep monitor wells on March 17, 2015. Depth to water in the deep monitor wells at Racetrack Hill facility ranged from 86.9 feet below the measuring point at RTH-8D to 225.3 feet at RTH-9D. Depth to water in C-1D at the Plant-C facility was 298.4 feet below the measuring point. Considering the depths where saturated deposits were indicated during drilling, the higher water levels in the completed wells indicate that the groundwater tapped by the wells is under pressure. Dee Jaspar and Associates, Inc. of Bakersfield surveyed the

TABLE 2-WATER-LEVEL DATA FOR DEEP MONITOR WELLS
(MARCH 17, 2015)

Well No.	Measuring Point Elevation (feet)	Depth to Water (feet)	Water-Level Elevation (feet)
RTH-7D	1,061.8	207.5	854.3
RTH-8D	874.7	86.9	787.8
RTH-9D	1,025.2	225.3	799.9
C-1D	635.5	298.4	337.1

Water levels were measured by KDSA. Measuring point elevations were surveyed by Dee Jaspar and Associates, Inc., of Bakersfield on March 20, 2015.

elevations of the new wells (Attachment E). Water-level elevations for the monitor wells at the Racetrack Hill facility ranged from 854.3 feet above mean sea level at RTH-7D to 787.8 feet at RTH-8D. Figure 3 shows water-level elevations and the direction of groundwater flow for the deep monitor wells at the Racetrack Hill facility on March 17, 2015. A north-northwest direction of groundwater flow was indicated. This indicates that pumping of wells north-northwest of the facility has influenced the flow direction. The water-level slope averaged about 130 feet per mile beneath the facility. The water-level elevation in C-1D at the Plant-C facility was 337.1 feet above mean sea level.

GROUNDWATER QUALITY

Attachment F provides field measurements for the initial sampling of the deep monitor wells, which was done during March 11-17, 2015. Three well volumes were removed by pumping from each well prior to the collection of water samples for laboratory analyses. The samples were preserved and shipped to FGL Environmental in Santa Paula for determination of inorganic chemical constituents and total organic carbon (TOC), to APPL, Inc. in Clovis for total petroleum hydrocarbons-diesel (TPH-d), and to the University of Arizona Environmental Isotope Laboratory, Tucson, Arizona for stable isotopes of water.

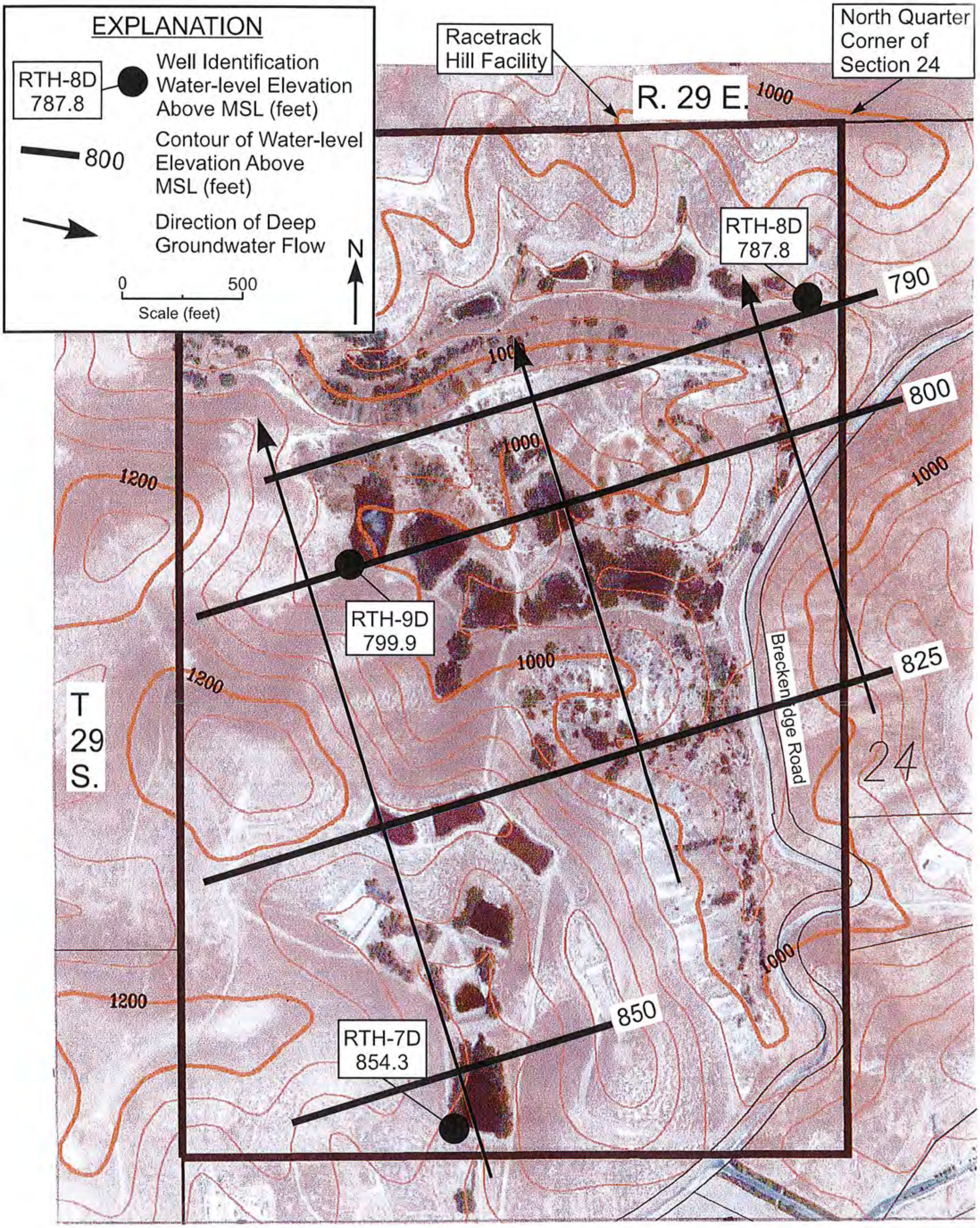

FIGURE 3 - WATER-LEVEL ELEVATIONS AND DIRECTION OF DEEP GROUNDWATER FLOW FOR RACETRACK HILL FACILITY (MARCH 17, 2015)

Table 3 summarizes the results of the laboratory analyses of water from the deep monitor wells. Laboratory analytical reports are provided in Attachment G.

Racetrack Hill Facility

Total dissolved solids (TDS) concentrations in the water samples from the deep monitor wells at this facility ranged from 2,960 to 4,180 mg/l. The lowest TDS concentration was at RTH-9D, and the highest (3,900 to 4,180 mg/l) were in water from RTH-7D and RTH-8D. Chloride concentrations in water from these wells ranged from 820 to 2,060 mg/l. The chloride concentration was highest in water from RTH-8D and was lowest in water from RTH-9D. Boron concentrations in water from these wells ranged from 0.2 to 9.1 mg/l. The lowest boron concentrations (0.2 to 0.3 mg/l) were in water from wells RTH-7D and RTH-9D, and the highest concentration was in water from RTH-8D. Sulfate concentrations in water from these wells ranged from 23 to 910 mg/l. The lowest sulfate concentration was for RTH-8D and the highest concentrations (860 to 910 mg/l) were in water from RTH-7D and RTH-9D. Sulfate type groundwater was previously found at RTH-3, a shallow monitor well south of RTH-8D. Total petroleum hydrocarbon-diesel (TPH-d) concentrations ranged from less than 50 to 280 ppb. The only detectable TPH-d concentration was in RTH-8D. Stable isotopes of water analyses indicate that the isotopically heaviest water was in

TABLE 3-CHEMICAL ANALYSES OF WATER FROM DEEP MONITOR WELLS
(MARCH 11-17, 2015)

Constituent (mg/l)	RTH-7D	RTH-8D	RTH-9D	C-1D
Calcium	535	514	464	101
Magnesium	104	161	26	18
Sodium	411	376	321	130
Potassium	35	14	17	4
Carbonate	<10	<10	<10	<10
Bicarbonate	320	310	210	280
Sulfate	910	23	860	110
Chloride	1,250	2,060	820	229
Nitrate	0.4	2.7	1.0	<0.5
Total Organic Carbon	0.5	0.8	0.5	0.9
Boron	0.3	9.1	0.2	0.2
pH	6.6	6.6	7.0	7.2
Electrical Conductivity (micromhos/cm @ 25°C)	5,420	6,490	4,000	1,400
Total Dissolved Solids (@ 180°C)	3,900	4,180	2,960	800
Iron	0.54	<0.05	<0.05	<0.05
Manganese	1.13	0.11	0.79	0.88
Deuterium (°/₀₀)	-60	-60	-65	-68
Oxygen 18 (°/₀₀)	-6.2	-7.4	-7.4	-8.4
Total Petroleum Hydrocarbons-Diesel (ppb)	<50	280	<50	<50
Temperature (°F)	79	71	77	80
Date	3/16/15	3/11/15	3/17/15	3/17/15
Perforated Interval (feet)	282-330	191-210	312-350	395-435

Laboratory analyses for inorganic chemical constituents and total organic carbon by FGL of Santa Paula, total petroleum hydrocarbons-diesel by APPL of Clovis, and stable isotopes by University of Arizona Environmental Isotope Laboratory, Tucson, Arizona.

water from RTH-7D and RTH-8D.

The quality of water from RTH-8D has been affected by the wastewater ponds, as indicated by the high concentrations of chloride, boron, and TPH-diesel.

Figure 4 is a trilinear diagram for water from the shallow and deep monitor wells at the Racetrack Hill facility and some other wells in the vicinity. The anion part of the diagram is considered most useful for interpretation, as the anions aren't influenced by processes such as cation exchange. Four different water types can be observed on the anion part of the diagram:

1. Greater than 80 percent chloride equivalents (RTH-1, 4, 6, and 8D). All of these monitor wells with this type are near facility wastewater ponds.
2. Chloride percentage less than 20 and sulfate percentage of 40 to 60 (RTH-5). RTH-5 taps shallow groundwater along Cottonwood Creek that has been not influenced by facility wastewater. Two off-site wells along Cottonwood Creek (12F and 26B) also had this water type.
3. Sulfate percentage of about 80 (RTH-3). RTH-3 taps shallow groundwater along the drainage along the east side of the facility. The inorganic chemical composition of this groundwater is similar to that of shallow groundwater along the west side of the San Joaquin Valley, where gypsum is common in the alluvial deposits.

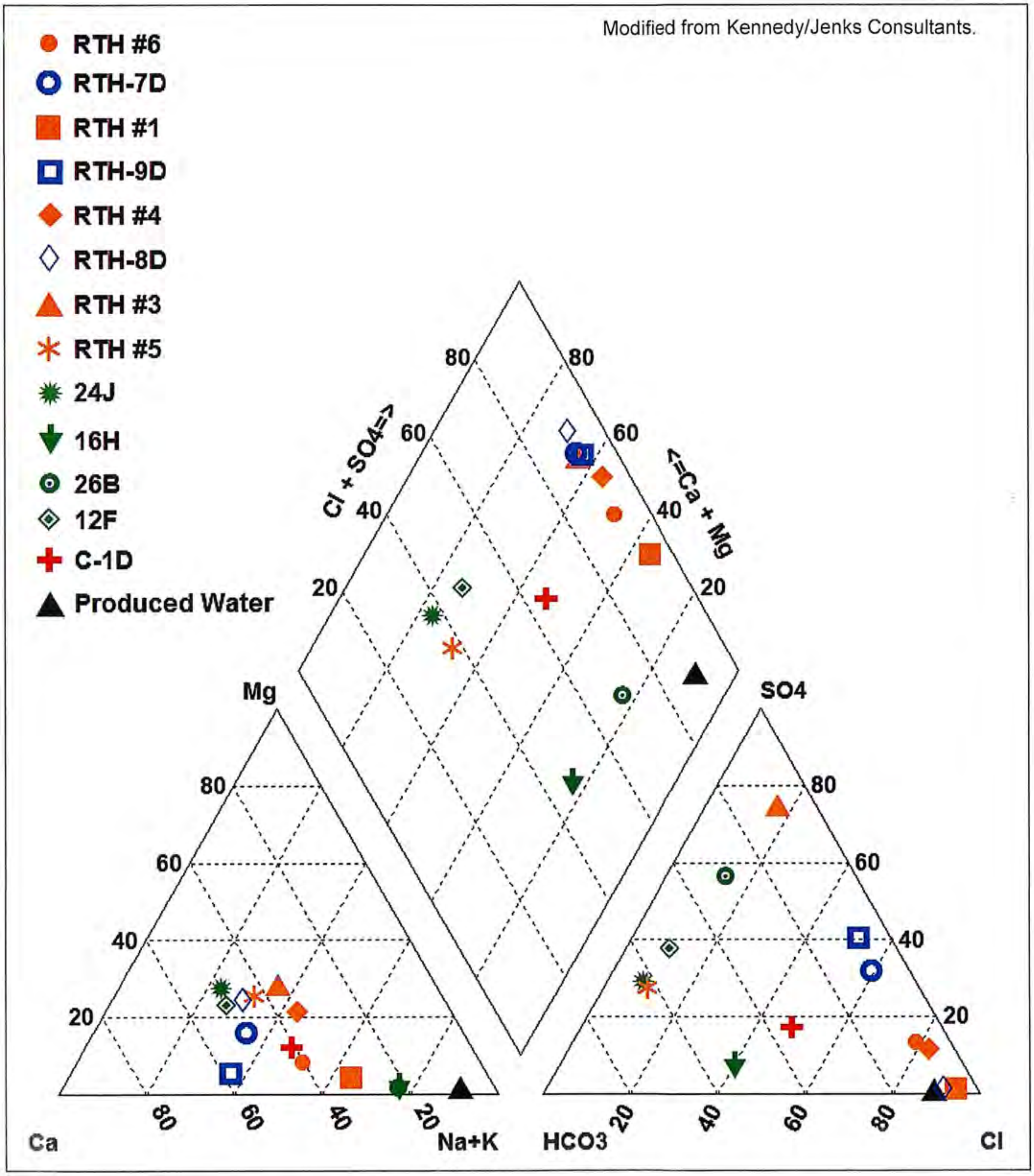

FIGURE 4-TRILINEAR DIAGRAM FOR WATER FROM WELLS

4. Chloride percentages ranging from about 50 to 60 and bicarbonate percentages of less than 10 (RTH-7D and 9D). RTH-7D and 9D are two deep monitor wells along the western part of the facility. Water from these two wells is indicated to be a mixture of the high sulfate percent (RTH-3) and high chloride percent groundwater (RTH-1, 4, and 6).

A water sample was recently collected from Domestic Well 26B, located along Cottonwood Creek upstream of RTH-5. Well 26B taps groundwater in the Santa Margarita Formation. A water sample was also collected from an unused Well 12F tapping alluvial deposits along Cottonwood Creek near Highway 178. The analyses of water from these wells indicates that high sulfate concentrations are present in background groundwater near Cottonwood Creek.

Plant-C Facility

Water from C-1D had a TDS concentration of 800 mg/l, chloride concentration of 229 mg/l, and boron concentration of 0.2 mg/l, all of which are not indicative of facility pond seepage. The anion percentages in water from C-1D aren't similar to either the high chloride water, the high sulfate water, or the apparent mixtures of the water types at the Racetrack Hill facility. The stable isotope of water analysis C-1D indicated the isotopically lightest composition of all of the deep monitor wells.

SUMMARY AND CONCLUSIONS

Three monitor wells were installed at the Racetrack Hill facility and one deep monitor well was installed at the Plant-C facility in February 2015. At the Racetrack Hill facility, each of the deep monitor wells was adjacent to an existing shallow monitor well. The deep monitor wells at the Racetrack Hill facility ranged from 210 feet deep in a topographically low area (RTH-8D) to 340 to 360 feet deep in topographically higher areas (RTH-7D and 9D). The northeastermost and lowest elevation deep well (RTH-8D) is indicated to tap the Santa Margarita Formation, whereas the other two deep monitor wells (RTH-7D and 9D) tap the overlying deposits of the Kern River-Chanac Formation. The monitor well at the Plant-C facility is 435 feet deep and also taps the Kern River-Chanac Formation.

Water-level measurements for the deep monitor wells on March 17, 2015 indicated depth to water ranged from about 87 to 225 feet at the Racetrack Hill facility and was about 298 feet at the Plant-C facility. The direction of groundwater flow at the Racetrack Hill facility was indicated to be to the north-northwest on March 17, 2015. The hydraulic gradient was about 130 feet per mile beneath the facility.

Total dissolved solids concentrations in water from the deep monitor wells at the Racetrack Hill facility ranged from 2,960 to

4,180 mg/l. Chloride concentrations ranged from 820 to 2,060 mg/l. A trilinear plot for anions (generally not influenced by exchange processes such as cations) indicates that water from RTH-8D was of same type as that for the nearby shallow monitor well (RTH-4). Water from both of these wells is indicated to have been influenced by wastewater pond seepage. Whereas the sulfate concentration in water from RTH-8D was low (23 mg/l), sulfate concentrations in water from RTH-7D and 9D ranged from 860 to 910 mg/l. The higher sulfate concentrations are not indicated to be associated with wastewater and are likely derived from naturally occurring processes. Appreciable sulfate concentrations have also been found in two off-site wells along Cottonwood Creek that haven't been affected by facility operations. At RTH-8D, the low sulfate concentration is indicated to be due to sulfate reduction. Reducing conditions have commonly been found in shallow groundwater beneath oil wastewater ponds. Water from RTH-7D and 9D thus appears to be a mixture of the high sulfate native groundwater and wastewater applied for irrigation. When the wastewater has been applied for irrigation, oxidizing conditions can be expected in the shallow groundwater.

The TDS concentration in water from C-1D was 800 mg/l and the chloride concentration was 110 mg/l, indicated to be at background levels in groundwater in the vicinity. Thus the results of sampling C-1D are indicative of no influence of the wastewater ponds in the vicinity of this well.

REFERENCES

Kennedy/Jenks Consultants, 2015, "Phase 1 Subsurface Investigation at the Field 34 Facility and Racetrack Hill Area, Edison Oil Field, California", 23 p.

Kenneth D. Schmidt and Associates, 2014, "Workplan for Deep Monitor Wells at Valley Water Management Company Racetrack Hill and Plant-C Facilities in Kern County", 17 p.

ATTACHMENT A
GEOPHYSICAL LOGS

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ELECTRIC LOG

FILING NO.

COMPANY Bradley & Sons Drilling

WELL Valley Water Management Co. RTH-7D (South)

FIELD Racetrack Hill

STATE California COUNTY Kern

LOCATION:

1.5 Miles Northeast of Commanche Drive & Breckenridge Road.
0.1 Mile North of Breckenridge Road.

OTHER SERVICES:
Sonic

JOB NO.
17674

SEC: 24M TWP: 29S RGE: 29E LAT.: LONG.: MERIDIAN.:

Permanent Datum: Ground Level, Elev. Ft. Elev.: K.B. Ft.
Log Measured From: Ground Level, 0 Ft. Above Perm. Datum D.F. Ft.
Drilling Measured From: Ground Level G.L. Ft.

Run		One			
Date		Feb. 06, 2015			
Depth-Driller		360 Ft	Ft	Ft	Ft
Depth-Logger		360 Ft	Ft	Ft	Ft
Top Logged Interval		7 Ft	Ft	Ft	Ft
Btm. Logged Interval		359 Ft	Ft	Ft	Ft
Casing-Driller		None In @ Ft	In @ Ft	In @ Ft	In @ Ft
Casing-Logger		None In @ Ft	In @ Ft	In @ Ft	In @ Ft
Bit Size		8.75 In	In	In	In
Time On Bottom		10:45			
Type Fluid In Hole		Bentonite			
Density	Viscosity	N/A | N/A			
pH	Fluid Loss	N/A | N/A ml	ml	ml	ml
Source of Sample		Pit			
Rm @ Measured Temp.		4.5 @ 75 °F	@ °F	@ °F	@ °F
Rmf @ Measured Temp.		3.9 @ 75 °F	@ °F	@ °F	@ °F
Rmc @ Measured Temp.		N/A @ °F	@ °F	@ °F	@ °F
Source Rmf	Rmc	Meas | N/A			
Rm @ BHT		N/A @ °F	@ °F	@ °F	@ °F
Time Since Circulation		1 Hr	Hr	Hr	Hr
Max. Rec. Temp.		N/A °F	°F	°F	°F
Van No.	Location	LV-1 | Bfld			
Recorded By		David Jackson			
Witnessed By		Jim Angell			

Bradley & Sons Drilling   Valley Water Management Co. RTH-7D (South)   Feb 06, 2015   Job Ticket: 17674

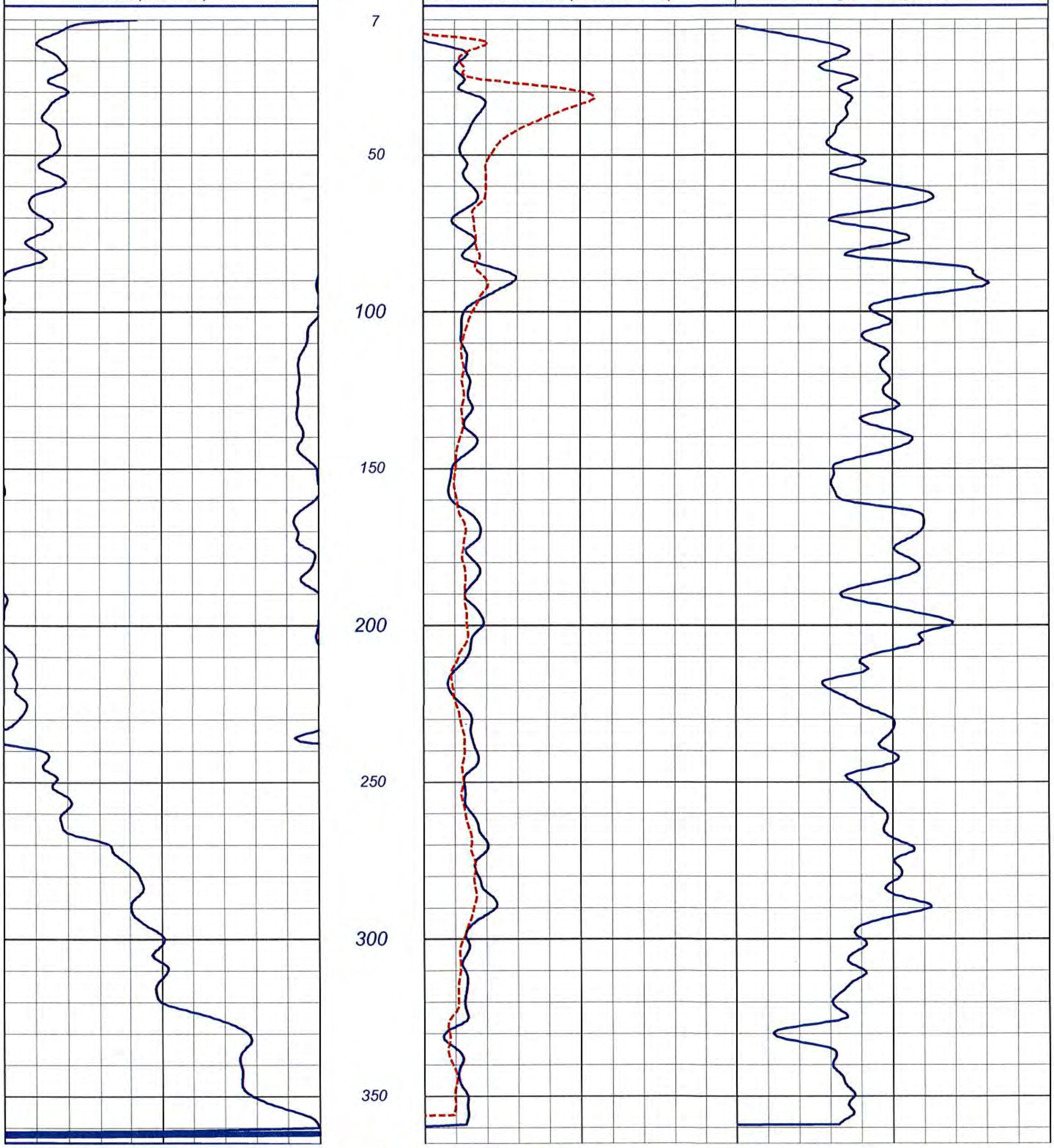
ELECTRIC LOG

DEPTHS

Single Page

0   64 Inch Normal (ohmmeter²/m)   50

< - S.P. (5 mV/div) + >   0   16 Inch Normal (ohmmeter²/m)   50 | 0   Single Point (ohms)   15



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SONIC-VDL-POROSITY LOG

FILING NO.

COMPANY Bradley & Sons Drilling

WELL Valley Water Management Co. RTH-7D (South)

FIELD Racetrack Hill

STATE California COUNTY Kern

LOCATION:
1.5 Miles Northeast of Commanche Drive & Breckenridge Road.
0.1 Mile North of Breckenridge Road.

OTHER SERVICES:
Elog

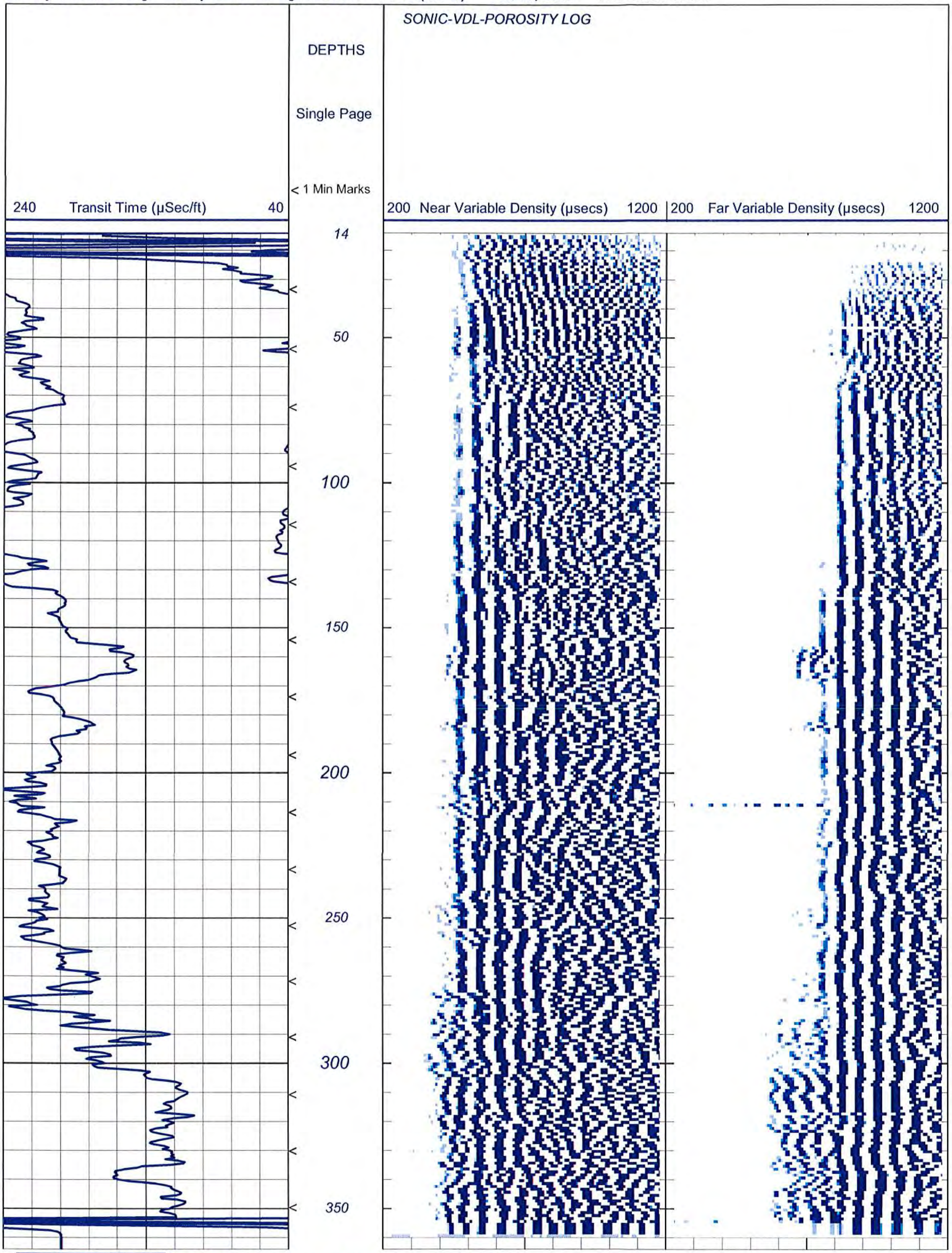
JOB NO.
17674

SEC: 24M TWP: 29S RGE: 29E LAT.: LONG.: MERIDIAN.:

Permanent Datum: Ground Level, Elev. Ft. Elev.: K.B. Ft.
Log Measured From: Ground Level, 0 Ft. Above Perm. Datum D.F. Ft.
Drilling Measured From: Ground Level G.L. Ft.

Date	Feb. 06, 2015			
Type Of Log	Sonic			
Run	One			
Depth-Driller	360 Ft	Ft	Ft	Ft
Depth-Logger	360 Ft	Ft	Ft	Ft
Top Logged Interval	7 Ft	Ft	Ft	Ft
Btm. Logged Interval	359 Ft	Ft	Ft	Ft
Type Fluid In Hole	Bentonite			
Fluid Level	Full Ft	Ft	Ft	Ft
Max Temp	N/A °F	°F	°F	°F
Operating Rig Time	.5 Hr	Hr	Hr	Hr
Van No. / Location	LV-1 / Bfld			
Recorded By	David Jackson			
Witnessed By	Jim Angell			

RUN	BOREHOLE RECORD			CASING RECORD			
NO.	BIT	FROM	TO	SIZE	TYPE	FROM	TO
1	8.75 In	0 Ft	360 Ft	None In		Ft	Ft
2	In	Ft	Ft	In		Ft	Ft
3	In	Ft	Ft	In		Ft	Ft


SONIC-VDL-POROSITY LOG
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200 Far Variable Density (µsecs) 1200
14
50
100
150
200
250
300
350

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California Contractor's License No. 722373

ELECTRIC LOG

FILING NO.

COMPANY Bradley & Sons Drilling

WELL Valley Water Management Co. RTH-8D (Northeast)

FIELD Racetrack Hill

STATE California COUNTY Kern

LOCATION:
2.5 Miles Northeast of Comanche Drive & Breckenridge Road, on the West side of Breckenridge Road.

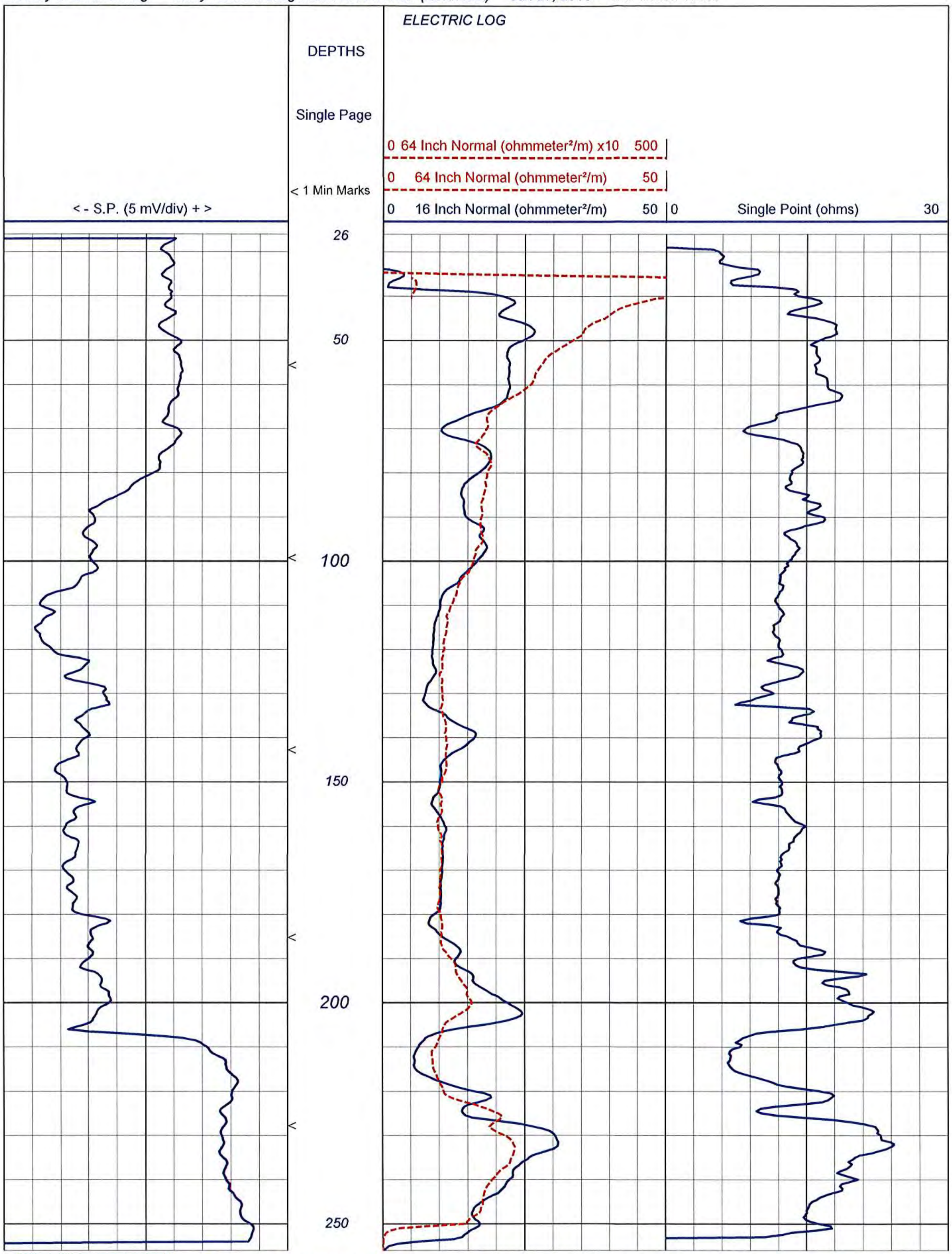
OTHER SERVICES:
Sonic

JOB NO.
17665

SEC: 24C TWP: 29S RGE: 29E LAT.: LONG.: MERIDIAN.:

Permanent Datum: Ground Level , Elev. Ft. Elev.: K.B. Ft.
Log Measured From: Ground Level , 0 Ft. Above Perm. Datum D.F. Ft.
Drilling Measured From: Ground Level G.L. Ft.

Run	One			
Date	Jan. 27, 2015			
Depth-Driller	260 Ft	Ft	Ft	Ft
Depth-Logger	256 Ft	Ft	Ft	Ft
Top Logged Interval	27 Ft	Ft	Ft	Ft
Btm. Logged Interval	255 Ft	Ft	Ft	Ft
Casing-Driller	N/A In @ -- Ft	In @ Ft	In @ Ft	In @ Ft
Casing-Logger	In @ Ft	In @ Ft	In @ Ft	In @ Ft
Bit Size	8.75 In	In	In	In
Time On Bottom	11:30			
Type Fluid In Hole	Bentonite			
Density / Viscosity	N/A / N/A			
pH / Fluid Loss	N/A / N/A ml	ml	ml	ml
Source of Sample	Pit			
Rm @ Measured Temp.	6.7 @ 75 °F	@ °F	@ °F	@ °F
Rmf @ Measured Temp.	5.8 @ 75 °F	@ °F	@ °F	@ °F
Rmc @ Measured Temp.	N/A @ -- °F	@ °F	@ °F	@ °F
Source Rmf / Rmc	Meas / N/A			
Rm @ BHT	N/A @ -- °F	@ °F	@ °F	@ °F
Time Since Circulation	.5 Hr	Hr	Hr	Hr
Max. Rec. Temp.	N/A °F	°F	°F	°F
Van No. / Location	LV-3 / Bfld			
Recorded By	David Jackson			
Witnessed By	Jim Angell			



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< - S.P. (5 mV/div) + >
0 16 Inch Normal (ohmmeter²/m) 50
0 Single Point (ohms) 30
26
50
100
150
200
250

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SONIC LOG

FILING NO.

COMPANY Bradley & Sons Drilling

WELL Valley Water Management Co. RTH-8D (Northeast)

FIELD Racetrack Hill

STATE California COUNTY Kern

LOCATION:
2.5 Miles Northeast of Comanche Drive & Breckenridge Road, on the West side of Breckenridge Road.

OTHER SERVICES: ELOG

JOB NO. 17665

SEC: 24C TWP: 29S RGE: 29E LAT.: LONG.: MERIDIAN.:

Permanent Datum: Ground Level, Elev. Ft. Elev.: K.B. Ft.
Log Measured From: Ground Level, 0 Ft. Above Perm. Datum D.F. Ft.
Drilling Measured From: Ground Level G.L. Ft.

Date	Jan. 27, 2015			
Type Of Log	Sonic			
Run	One			
Depth-Driller	260 Ft	Ft	Ft	Ft
Depth-Logger	256 Ft	Ft	Ft	Ft
Top Logged Interval	27 Ft	Ft	Ft	Ft
Btm. Logged Interval	255 Ft	Ft	Ft	Ft
Type Fluid In Hole	Bentonite			
Fluid Level	Full Ft	Ft	Ft	Ft
Max Temp	N/A °F	°F	°F	°F
Operating Rig Time	.5 Hr	Hr	Hr	Hr
Van No. / Location	LV-3 / Bfld			
Recorded By	David Jackson			
Witnessed By	Jim Angell			

RUN	BOREHOLE RECORD			CASING RECORD			
NO.	BIT	FROM	TO	SIZE	TYPE	FROM	TO
1	8.75 In	0 Ft	256 Ft	N/A In		Ft	Ft
2	In	Ft	Ft	In		Ft	Ft
3	In	Ft	Ft	In		Ft	Ft

SONIC LOG

DEPTHS

Single Page

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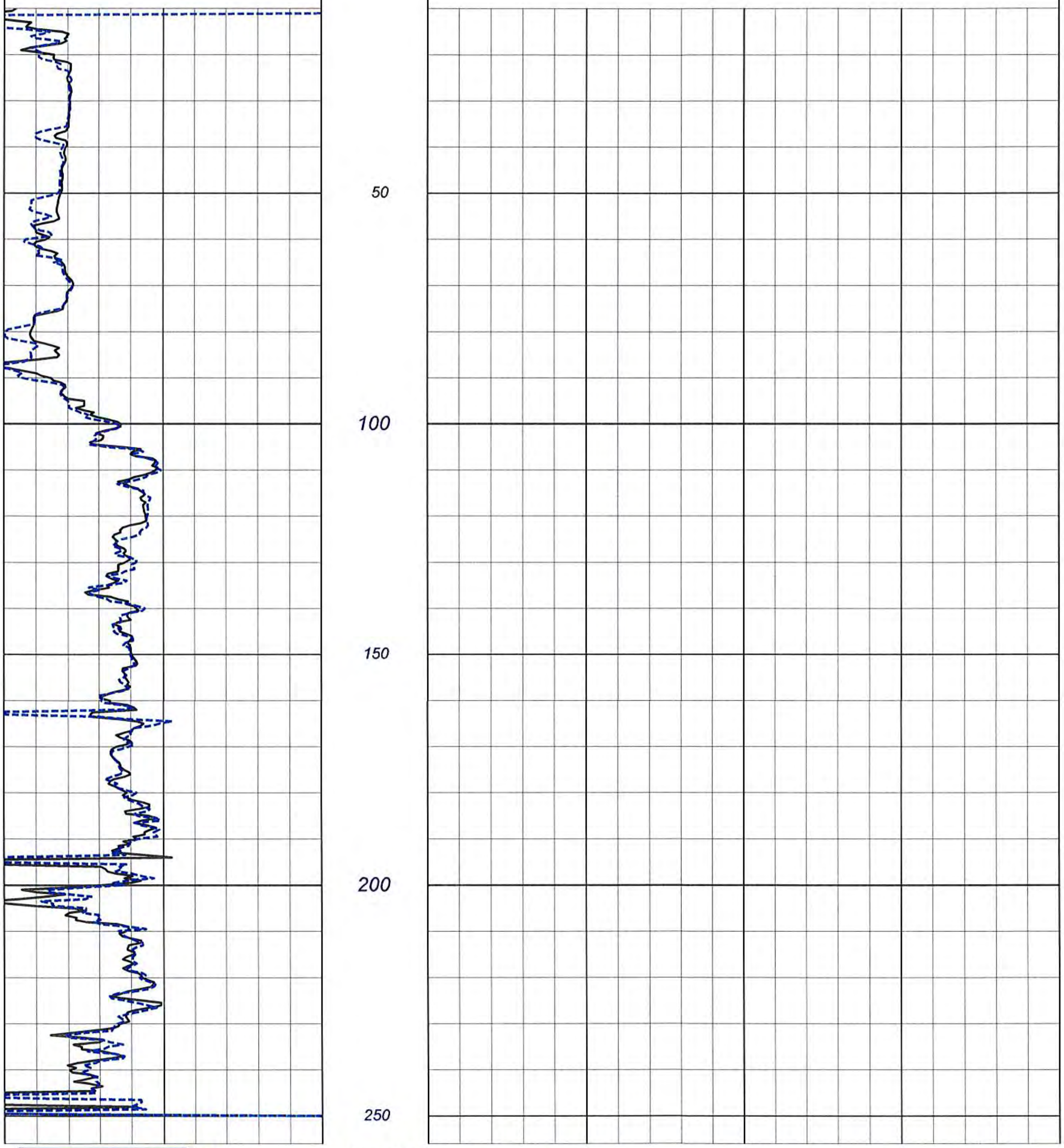
240	Transit Time (µSec/ft)	40



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ELECTRIC LOG

FILING NO.

COMPANY Bradley & Sons Drilling

WELL Valley Water Management Co. RTH-9D (West)

FIELD Racetrack Hill

STATE California COUNTY Kern

LOCATION:
2.4 Miles Northeast of Comanche Drive & Breckenridge Road,
0.3 Mile West of Breckenridge Road.

OTHER SERVICES:
Sonic

JOB NO.
17665

SEC: 24E TWP: 29S RGE: 29E LAT.: LONG.: MERIDIAN.:

Permanent Datum: Ground Level , Elev. Ft. Elev.: K.B. Ft.
Log Measured From: Ground Level , 0 Ft. Above Perm. Datum D.F. Ft.
Drilling Measured From: Ground Level G.L. Ft.

Run		One			
Date		Jan. 30, 2015			
Depth-Driller		360 Ft	Ft	Ft	Ft
Depth-Logger		360 Ft	Ft	Ft	Ft
Top Logged Interval		27 Ft	Ft	Ft	Ft
Btm. Logged Interval		255 Ft	Ft	Ft	Ft
Casing-Driller		N/A In @ -- Ft	In @ Ft	In @ Ft	In @ Ft
Casing-Logger		In @ Ft	In @ Ft	In @ Ft	In @ Ft
Bit Size		8.75 In	In	In	In
Time On Bottom		13:30			
Type Fluid In Hole		Bentonite			
Density	Viscosity	N/A N/A			
pH	Fluid Loss	N/A N/A ml	ml	ml	ml
Source of Sample		Pit			
Rm @ Measured Temp.		7.1 @ 75 °F	@ °F	@ °F	@ °F
Rmf @ Measured Temp.		6.7 @ 75 °F	@ °F	@ °F	@ °F
Rmc @ Measured Temp.		N/A @ -- °F	@ °F	@ °F	@ °F
Source Rmf	Rmc	Meas N/A			
Rm @ BHT		N/A @ -- °F	@ °F	@ °F	@ °F
Time Since Circulation		.5 Hr	Hr	Hr	Hr
Max. Rec. Temp.		N/A °F	°F	°F	°F
Van No.	Location	LV-3 Bfld			
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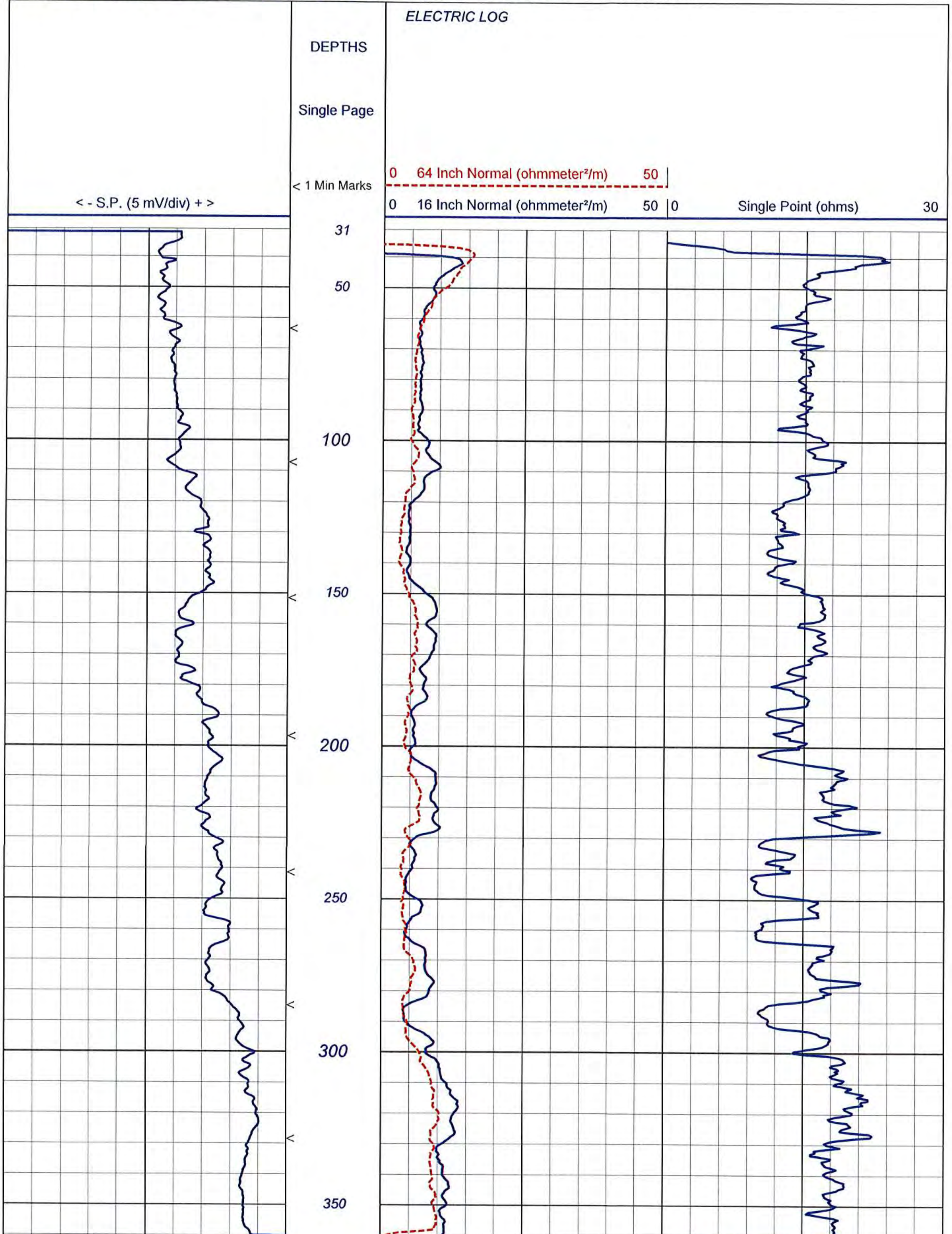
Witnessed By		Jim Angell			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0 16 Inch Normal (ohmmeter²/m) 50
0 Single Point (ohms) 30
31
50
100
150
200
250
300
350

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SONIC-VDL-POROSITY LOG

FILING NO.

COMPANY: Bradley & Sons Drilling

WELL: Valley Water Management Co. RTH-9D (West)

FIELD: Racetrack Hill

STATE: California COUNTY: Kern

LOCATION:

2.4 Miles Northeast of Comanche Drive & Breckenridge Road,
0.3 Mile West of Breckenridge Road.

OTHER SERVICES:
Elog

JOB NO.
17665

SEC: 24E TWP: 29S RGE: 29E LAT.: LONG.: MERIDIAN.:

Permanent Datum: Ground Level, Elev. Ft. Elev.: K.B. Ft.
Log Measured From: Ground Level, 0 Ft. Above Perm. Datum D.F. Ft.
Drilling Measured From: Ground Level G.L. Ft.

Date	Jan. 30, 2015				
Type Of Log	Sonic				
Run	One				
Depth-Driller	360 Ft		Ft	Ft	Ft
Depth-Logger	360 Ft		Ft	Ft	Ft
Top Logged Interval	13 Ft		Ft	Ft	Ft
Btm. Logged Interval	355 Ft		Ft	Ft	Ft
Type Fluid In Hole	Bentonite				
Fluid Level	Full Ft		Ft	Ft	Ft
Max Temp	N/A °F		°F	°F	°F
Operating Rig Time	.5 Hr		Hr	Hr	Hr
Van No. / Location	LV-3	Bfld			
Recorded By	David Jackson				
Witnessed By	Jim Angell				

RUN	BOREHOLE RECORD			CASING RECORD			
NO.	BIT	FROM	TO	SIZE	TYPE	FROM	TO
1	8.75 In	0 Ft	360 Ft	N/A In		Ft	Ft
2	In	Ft	Ft	In		Ft	Ft
3	In	Ft	Ft	In		Ft	Ft

SONIC-VDL-POROSITY LOG

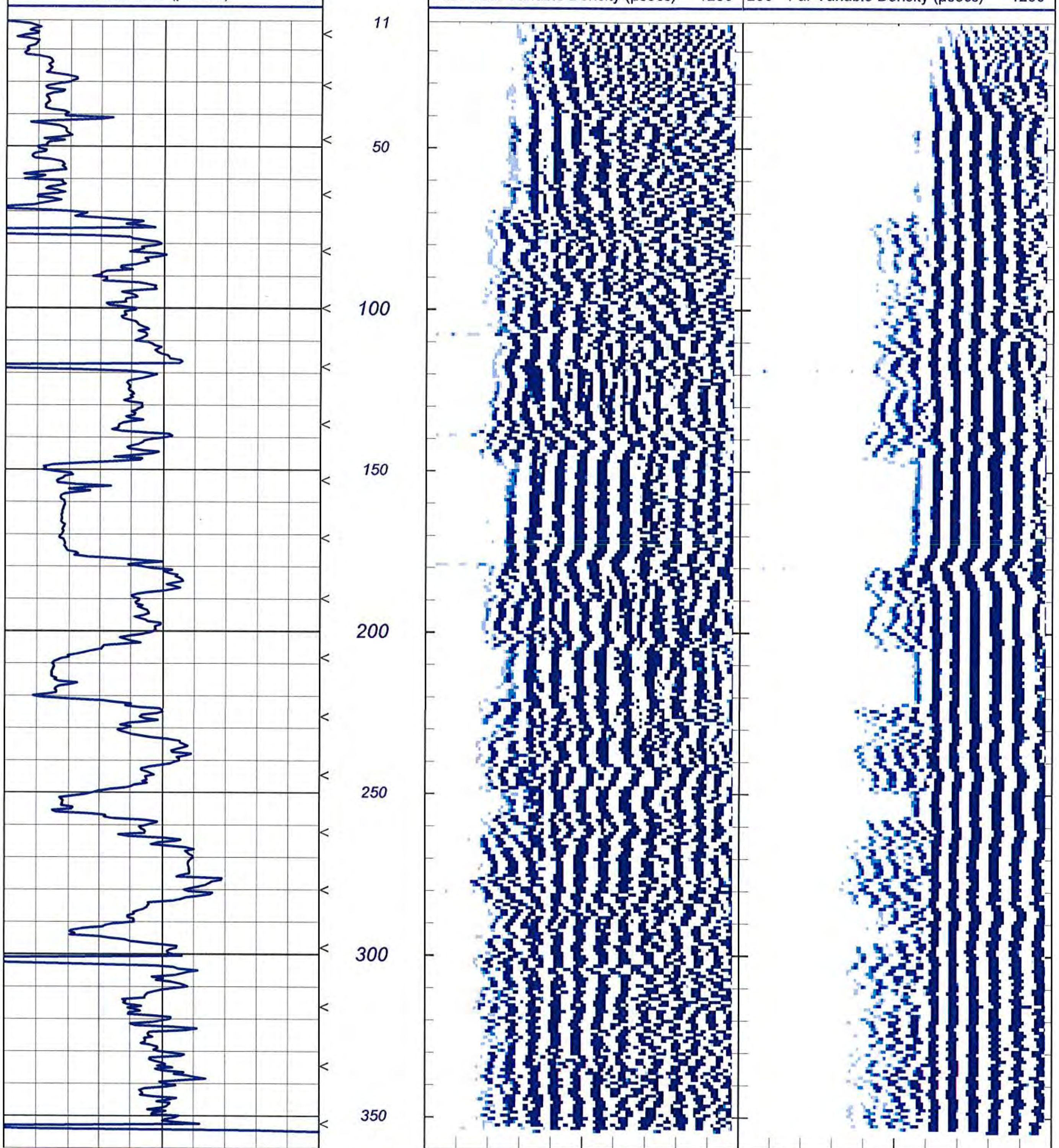
DEPTHS

Single Page

< 1 Min Marks

240 Transit Time (μSec/ft) 40

200 Near Variable Density (μsecs) 1200 | 200 Far Variable Density (μsecs) 1200



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ELECTRIC LOG

FILING NO.

COMPANY Bradley & Sons Drilling

WELL Valley Water Management Company C-1D

FIELD C Plant

STATE California COUNTY Kern

LOCATION:

1.3 Miles West of Comanche Drive
0.5 Mile South of Breckenridge Road

OTHER SERVICES:
Sonic

JOB NO.
17692

SEC: 34N TWP: 29S RGE: 29E LAT.: 35° 21' 17.2" LONG.: 118° 51' 38.8" MERIDIAN.: Mt. Diablo

Permanent Datum: Ground Level, Elev. Ft. Elev.: K.B. Ft.
Log Measured From: Ground Level, 0 Ft. Above Perm. Datum D.F. Ft.
Drilling Measured From: Ground Level G.L. Ft.

Run	One			
Date	Feb. 19, 2015			
Depth-Driller	460 Ft	Ft	Ft	Ft
Depth-Logger	460 Ft	Ft	Ft	Ft
Top Logged Interval	7 Ft	Ft	Ft	Ft
Btm. Logged Interval	459 Ft	Ft	Ft	Ft
Casing-Driller	None In @ -- Ft	In @ Ft	In @ Ft	In @ Ft
Casing-Logger	None In @ -- Ft	In @ Ft	In @ Ft	In @ Ft
Bit Size	8.75 In	In	In	In
Time On Bottom	10:23			
Type Fluid In Hole	Bentonite			
Density / Viscosity	N/A / N/A			
pH / Fluid Loss	N/A / N/A ml	ml	ml	ml
Source of Sample	Pit			
Rm @ Measured Temp.	9.6 @ 75 °F	@ °F	@ °F	@ °F
Rmf @ Measured Temp.	8.7 @ 75 °F	@ °F	@ °F	@ °F
Rmc @ Measured Temp.	N/A @ -- °F	@ °F	@ °F	@ °F
Source Rmf / Rmc	Meas / N/A			
Rm @ BHT	N/A @ -- °F	@ °F	@ °F	@ °F
Time Since Circulation	1 Hr	Hr	Hr	Hr
Max. Rec. Temp.	N/A °F	°F	°F	°F
Van No. / Location	LV-1 / Bfld			
Recorded By	David Jackson			
Witnessed By	Jim Angell			

Bradley & Sons Drilling   Valley Water Management Company C-1D   Feb 19, 2015   Job Ticket: 17692

ELECTRIC LOG

DEPTHS

Single Page

< 1 Min Marks

< - S.P. (10 mV/div) + >

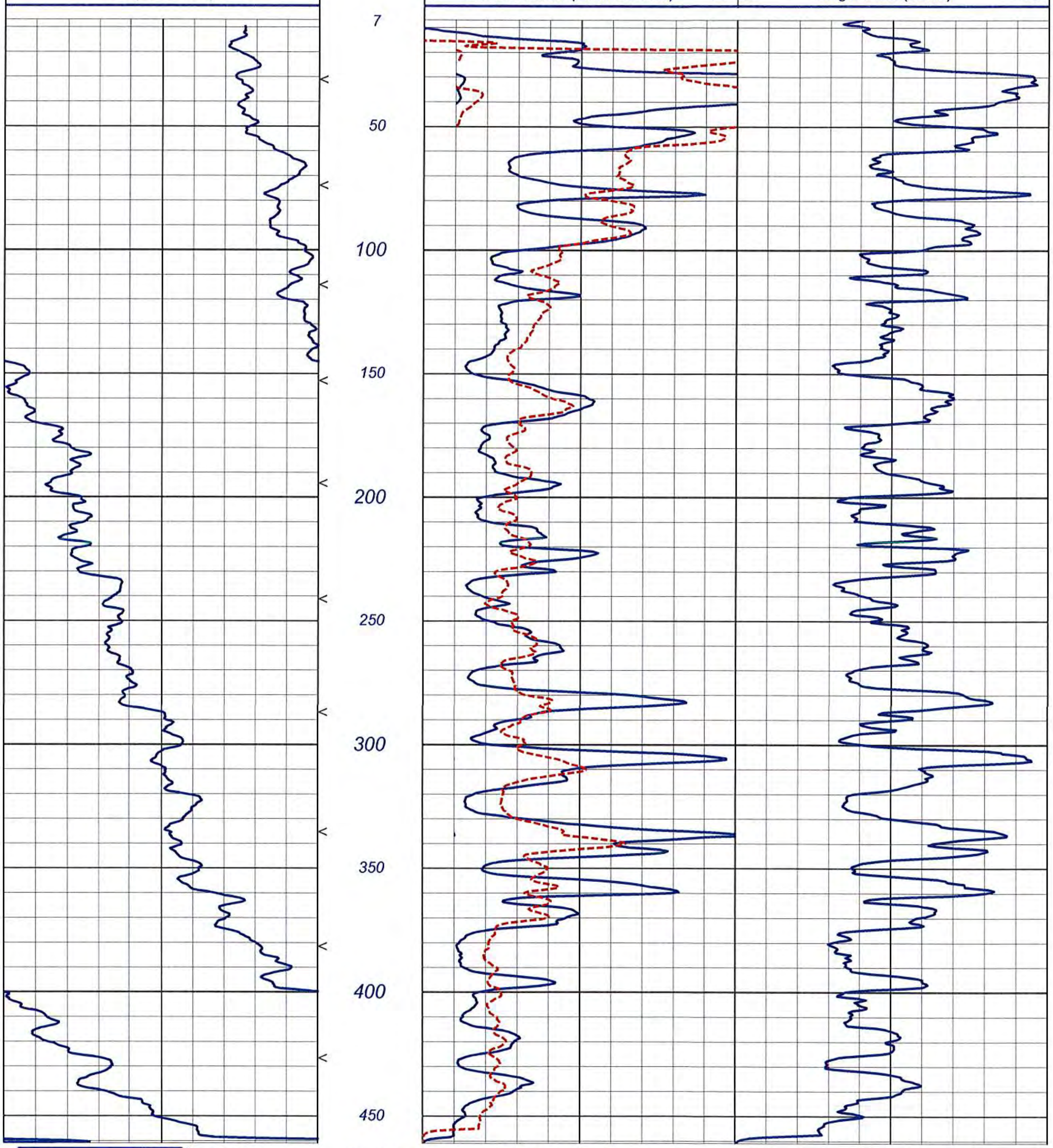
0 64 Inch Normal (ohmmeter²/m) x10 500

0 64 Inch Normal (ohmmeter²/m) 50

0 16 Inch Normal (ohmmeter²/m) x10 500

0 16 Inch Normal (ohmmeter²/m) 50

0 Single Point (ohms) 50



welenco

5201 Woodmere Drive, Bakersfield, CA 93313-- www.welenco.com--(800) 445-9914
California Contractor's License No. 722373

FULL WAVEFORM SONIC - VDL LOG

FILING NO.

COMPANY Bradley & Sons Drilling

WELL Valley Water Management Company C-1D

FIELD C Plant

STATE California COUNTY Kern

LOCATION:

1.3 Miles West of Comanche Drive
0.5 Mile South of Breckenridge Road

OTHER SERVICES:
Elog

JOB NO.
17692

SEC: 34N TWP: 29S RGE: 29E LAT.: 35° 21' 17.2" LONG.: 118° 51' 38.8" MERIDIAN.: Mt. Diablo

Permanent Datum: Ground Level, Elev.____ Ft. Elev.: K.B.____ Ft.
Log Measured From: Ground Level, 0 Ft. Above Perm. Datum D.F.____ Ft.
Drilling Measured From: Ground Level G.L.____ Ft.

Date	Feb. 19, 2015			
Type Of Log	Sonic			
Run	One			
Depth-Driller	460 Ft	Ft	Ft	Ft
Depth-Logger	460 Ft	Ft	Ft	Ft
Top Logged Interval	7 Ft	Ft	Ft	Ft
Btm. Logged Interval	459 Ft	Ft	Ft	Ft
Type Fluid In Hole	Bentonite			
Fluid Level	Full Ft	Ft	Ft	Ft
Max Temp	N/A °F	°F	°F	°F
Operating Rig Time	.5 Hr	Hr	Hr	Hr
Van No. / Location	LV-1 / Bfld			
Recorded By	David Jackson			
Witnessed By	Jim Angell			

RUN	BOREHOLE RECORD			CASING RECORD			
NO.	BIT	FROM	TO	SIZE	TYPE	FROM	TO
1	8.75 In	0 Ft	460 Ft	None In		Ft	Ft
2	In	Ft	Ft	In		Ft	Ft
3	In	Ft	Ft	In		Ft	Ft

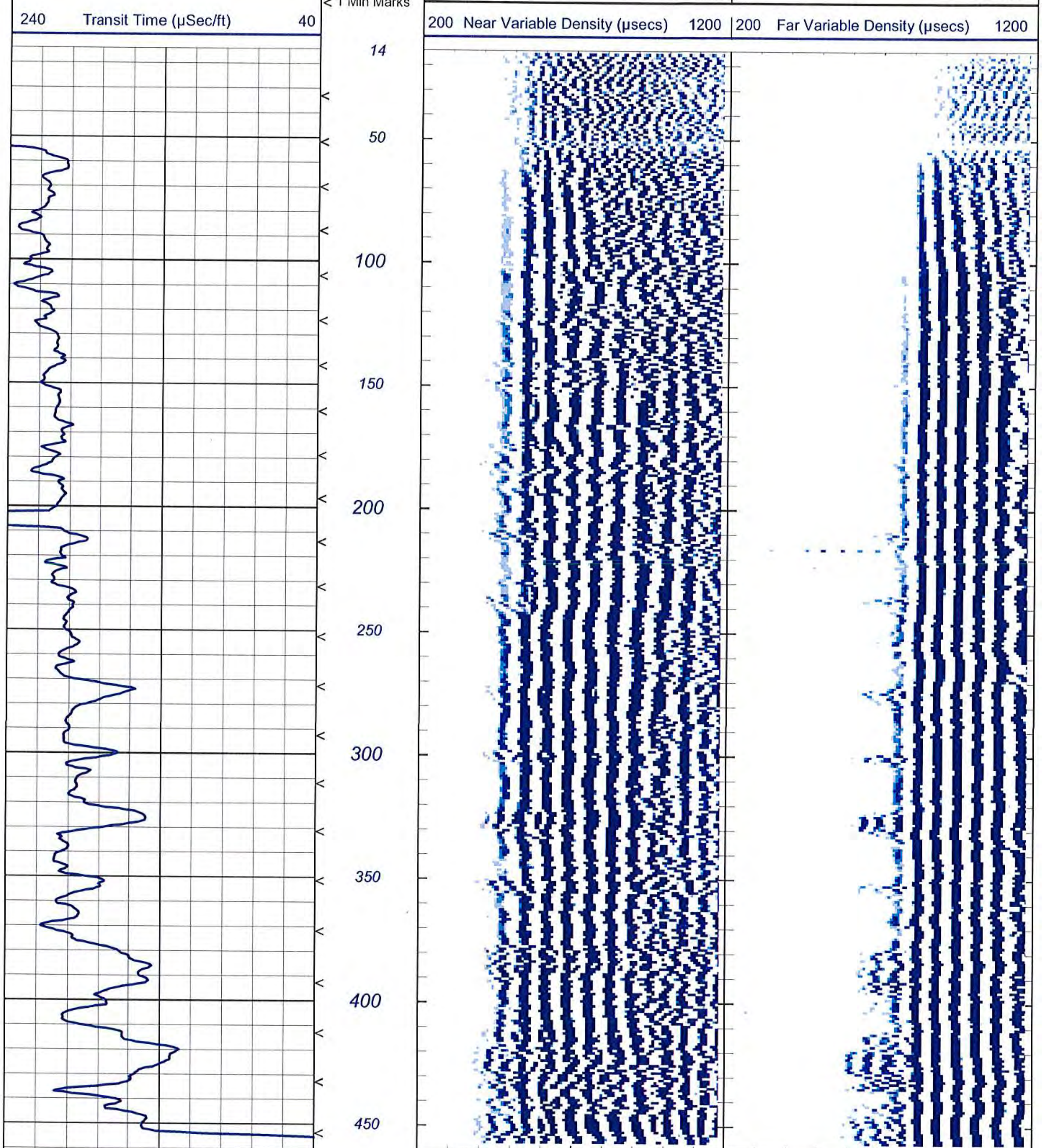
Bradley & Sons Drilling   Valley Water Management Company C-1D   Feb 19, 2015   Job Ticket: 17692

FULL WAVEFORM SONIC - VDL LOG

DEPTHS

Single Page

< 1 Min Marks



welenco
CA. Contractor's License: 722373

Phone: (800) 445-9914 Fax: (661) 834-2550 Email: welenco@welenco.com Web: www.welenco.com

(Prepared with Log Print, a professional software application developed by welenco, Inc.)

ATTACHMENT B
GEOLOGIC LOGS

GEOLOGIC LOG FOR VALLEY WATER MANAGEMENT CO.
DEEP MONITOR WELL RTH-7D

Depth (feet)	Description	USC
0-7	Yellowish brown silty fine to medium sand	SM
7-11	Brown fine to coarse sand	SW
11-14	Yellowish brown fine sandy silt	ML
14-17	Yellowish brown, olive brown and white medium coarse sandy silt	ML
17-27	Brown and some yellowish brown fine to coarse sand with gravel	SW
27-30	Yellowish brown silty fine sand	SM
30-35	Brown and some yellowish brown fine to coarse Sand with gravel	SW
35-39	Yellowish brown and white silty fine to medium sand	SM
39-43	Brown and some yellowish brown fine to coarse sand with gravel	SW
43-47	Yellowish brown, olive brown and white silty fine sand with some clay	SM
47-55	Yellowish brown and olive brown fine to medium sandy silt	ML
55-59	Brownish gray silty fine sand	SM
59-61	Brownish gray fine to coarse sand	SW
61-65	Olive brown and white silty fine to coarse sand	SM
65-75	Gray and some olive yellow fine to coarse sand with gravel	SW
75-80	Yellowish brown, olive brown and some olive yellow silty fine sand	SM
80-87	Gray and some olive yellow fine to coarse sand with gravel	SW
87-90	Grayish brown and white silty fine sand	SM
90-98	Gray fine to coarse sand with gravel	SW
98-101	Grayish brown fine to medium sand	SM
101-116	Gray fine to coarse sand with some gravel	SW
116-117	Brownish gray fine to medium sand with silt	SW
117-140	Gray fine to coarse sand with gravel	SW
140-146	Brownish gray fine to coarse sand with gravel	SW
146-162	Gray-brown clay	CL
162-185	Gray-brown fine to coarse silty sand	SM
185-194	Gray sandy clay	CL
194-208	Brown-gray fine to coarse silty sand	SM
208-216	Brown-gray fine silty sand	SM
216-224	Brown-gray and blue sandy clay	CL

Continued:

GEOLOGIC LOG FOR VALLEY WATER MANAGEMENT CO.
DEEP MONITOR WELL RTH-7D (Continued:)

Depth (feet)	Description	USC
224-230	Brown-gray fine to coarse silty sand with gravel	SM
230-246	Gray-blue fine to coarse silty sand with gravel	SM
246-255	Gray-blue sandy clay	CL
255-268	Gray-blue fine to coarse silty sand	SM
268-293	Gray-blue fine to coarse sandy gravel	GP
293-326	Gray-blue fine to coarse silty sand with gravel	SM
326-334	Gray-blue clay	CL
334-360	Gray-blue fine to coarse silty sand with gravel	SM

Date Hole Drilled: 2/6/15
Saturated Deposits at about 134 feet deep
Depth to Water: 207 feet (pressure level)

Note: The log for the interval from 0 to 145 feet in depth was also based on the geologic log for adjacent well RTH-6 by Kennedy/Jenks Consultants.

James R. Angell
Geologist No. 8460
Certified Hydrogeologist No. 919

March 18, 2015

GEOLOGIC LOG FOR VALLEY WATER MANAGEMENT CO.
DEEP MONITOR WELL RTH-8D

Depth (feet)	Description	USC
0-22	Yellowish brown silty fine sand	SM
22-32	Yellowish brown, olive yellow, brown fine sandy silt	ML
32-45	Gray and some olive yellow fine to medium sand	SP
45-47	Brownish gray fine sandy silt	ML
47-55	Gray and some brownish yellow fine to coarse sand	SW
55-57	Brownish gray fine sandy silt	ML
57-66	Gray and some brownish yellow fine to coarse sand	SW
66-73	Gray and some brownish yellow sandy silt	ML
73-90	Gray and some brownish yellow fine to coarse sand	SW
90-102	Yellowish brown, black, and gray fine to coarse sandy gravel and gravelly sand	GW/SW
102-106	Brown and white yellow fine to coarse sand	SP
106-135	Brown silty fine sand	SM
135-144	Gray fine to coarse sand	SW
144-184	Brown silty fine sand and clay	SM/SC
184-206	Brown-gray fine to coarse sand with some gravel	SP
206-218	Blue and brown-gray clay	CL
218-224	Gray-brown fine to medium silty sand	SM
224-226	Blue and gray-brown clay	CL
226-234	Gray-brown medium sand	SP
234-244	Gray-brown fine to coarse sand	SP
244-256	Gray-brown clayey fine to coarse sand	SC

Date Hole Drilled: 1/27/15
Saturated Deposits at about 90 feet deep

Note: The log for the interval from 0 to 150 feet in depth was also based on the geologic log for adjacent well RTH-4 by Kennedy/Jenks Consultants.

James R. Angell
Geologist No. 8460
Certified Hydrogeologist No. 919

March 18, 2015

GEOLOGIC LOG FOR VALLEY WATER MANAGEMENT CO.
DEEP MONITOR WELL RTH-9D

Depth (feet)	Description	USC
0-23	Yellowish brown silty fine to medium sand with Clay	SM
23-32	Brownish gray fine sandy silt with clay	ML
32-38	Brownish gray clayey and silty fine to coarse Sand	SC/SM
38-58	White and brownish gray fine to coarse sand	SW
58-60	Brownish gray silty fine to coarse sand	SM
60-63	Brownish gray fine to medium sand	SP
63-76	Brownish gray and white fine to coarse sand with some silt	SW
76-77	Brownish gray silty fine sand	SM
77-87	Brownish gray and white fine to medium sand	SW
87-111	Gray, brownish gray and white fine to coarse sand	SW
111-120	Gray and brown fine to medium sand	SW
120-146	Gray and brown clayey fine to medium sand with some gravel	SC
146-187	Brown, white, black, gray fine to medium sand with some gravel and clay	SW
187-204	Brown, white, black, and green-gray clayey fine sand	SC
204-220	Brown, white, black and green-gray fine sand	SP
220-229	Brown-gray coarse sand with some gravel	SP
229-234	Brown-gray clay	CL
234-242	Brown-gray clayey coarse silty sand	SC
242-249	Brown-gray clay	CL
249-256	Brown-gray fine to medium silty sand	SM
256-264	Brown-gray clay	CL
264-284	Brown gray fine to coarse sand	SW
284-292	Blue and brown clay	CL
292-299	Blue and brown fine to coarse silty sand with gravel	SM
299-360	Brown fine to coarse sand with gravel	SP

Date Hole Drilled: 1/30/15
Saturated Deposits at about 72 feet in depth
Depth to Water: 225 feet (pressure level)

Note: The log for the interval from 0 to 102 feet in depth was also based on the geologic logs for adjacent well RTH-1 and TH-2 by Kennedy/Jenks Consultants.

James R. Angell
Geologist No. 8460
Certified Hydrogeologist No. 919

March 18, 2015

GEOLOGIC LOG FOR VALLEY WATER MANAGEMENT CO.
DEEP MONITOR WELL C-1D

Depth (feet)	Description	USC
0-12	Brown fine to coarse silty sand with some clay	SM
12-20	Brown coarse sand with gravel	SW
20-26	Brown clay	CL
26-45	Brown fine to coarse sand with gravel	SW
45-50	Brown clay	CL
50-60	Brown fine to coarse sand with gravel	SW
60-74	Brown clay	CL
74-79	Brown fine to coarse sand with gravel	SW
79-87	Brown clay	CL
87-98	Brown fine to coarse sand with gravel	SW
98-107	Brown clay	CL
107-110	Brown sandy clay with gravel	CL
110-115	Brown clay	CL
115-120	Brown fine to coarse sand with gravel	SW
120-143	Brown clayey fine to coarse sand with gravel	SC
143-152	Brown clay	CL
152-170	Brown fine to coarse sand with gravel	SW
170-183	Brown clay	CL
183-191	Brown sandy clay with gravel	CL
191-199	Brown fine to coarse sand with gravel	SW
199-211	Brown clay	CL
211-217	Brown fine to coarse silty sand with gravel and clay	SM
217-220	Brown clay	CL
220-232	Brown fine silty sand with gravel	SM
232-242	Brown clay	CL
242-245	Brown clayey fine sand	SC
245-251	Brown clay	CL
251-258	Brown clayey fine to coarse sand with gravel	SC
258-264	Brown fine to coarse silty sand with gravel	SM
264-268	Brown clayey fine to coarse sand with gravel	SC
268-277	Brown clay	CL
277-287	Brown fine to coarse sand with some gravel	SW
287-294	Brown fine sandy clay	CL
294-301	Brown clay	CL
301-316	Brown fine to coarse sand with gravel	SW
316-330	Brown clay	CL
330-347	Brown fine to coarse sand with some gravel	SW
347-354	Brown clay	CL
354-362	Brown fine to coarse sand with some gravel	SW
362-366	Brown clay	CL

Continued:

GEOLOGIC LOG FOR VALLEY WATER MANAGEMENT CO.
DEEP MONITOR WELL C-1D (Continued:)

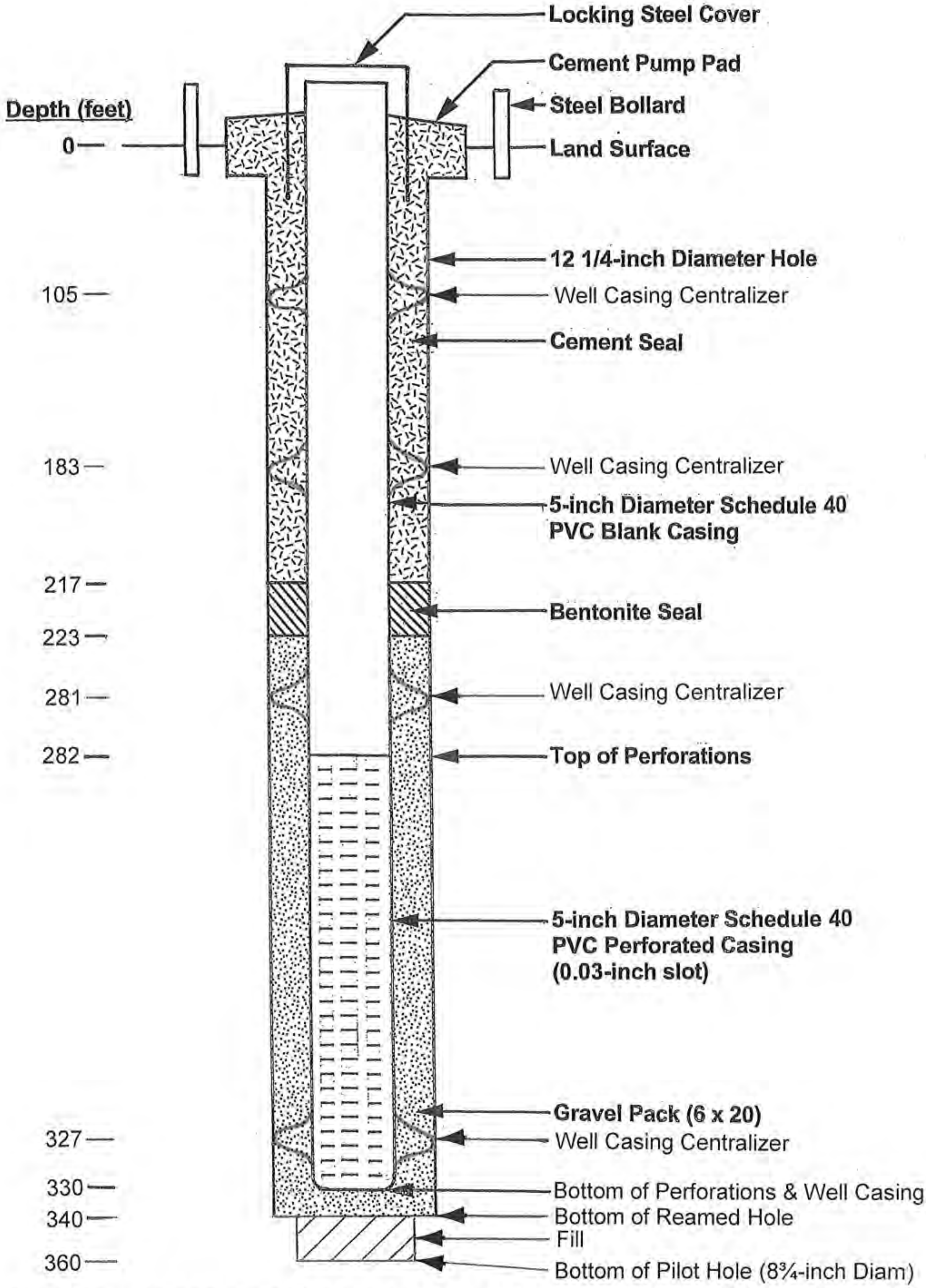
Depth (feet)	Description	USC
366-374	Brown fine silty sand with some gravel	SM
374-393	Brown clay	CL
393-399	Brown fine silty sand	SM
399-415	Brown clay	CL
415-425	Brown fine silty sand with some gravel and clay	SM
425-432	Gray clay	CL
432-442	Brown fine silty sand with gravel and some clay	SM
442-460	Gray clay	CL

Date Hole Drilled: 2/19/15
Saturated Deposits at about 380 feet deep
Pressure Level 298 feet deep

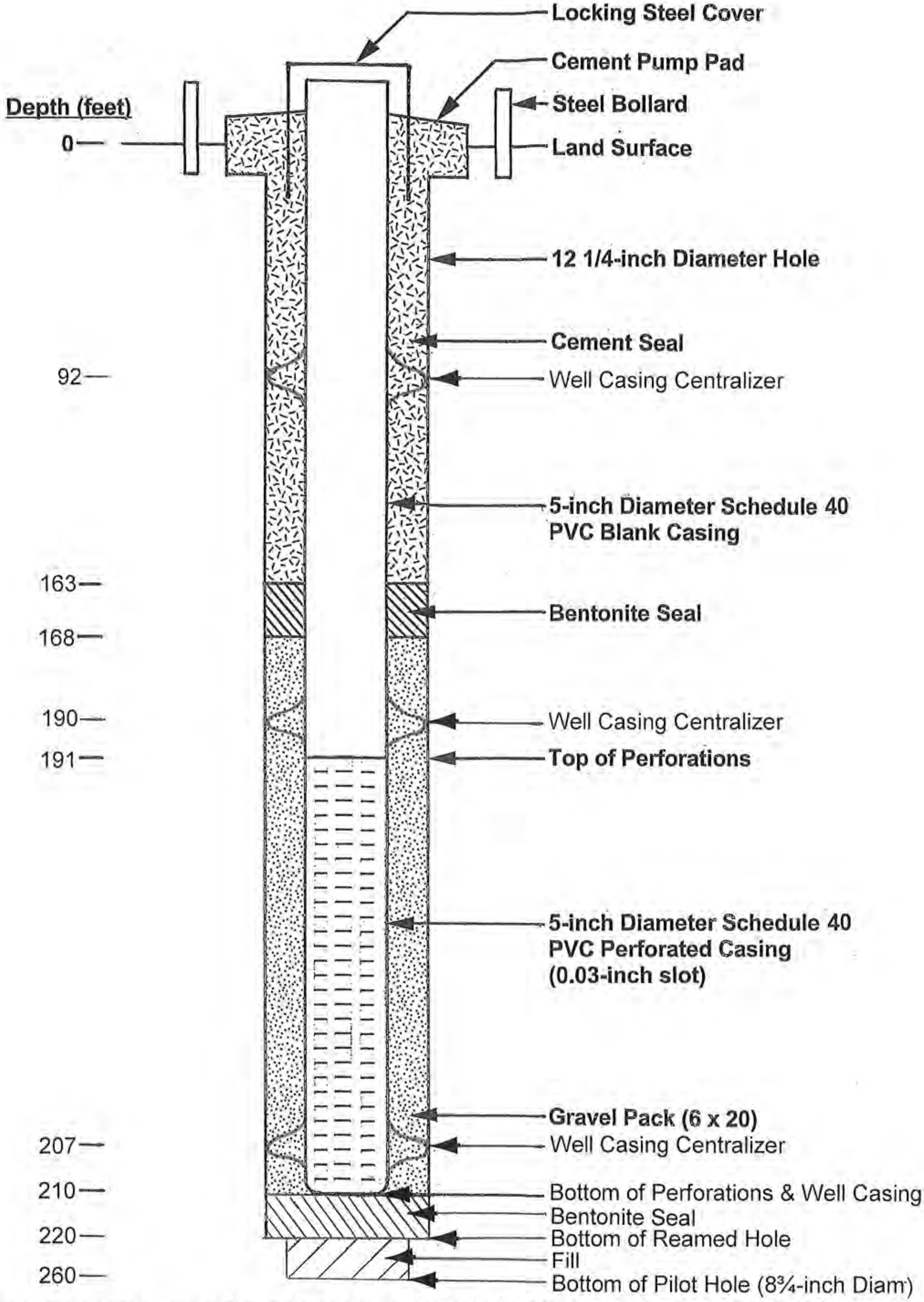
James R. Angell
Geologist No. 8460
Certified Hydrogeologist No. 919

March 18, 2015

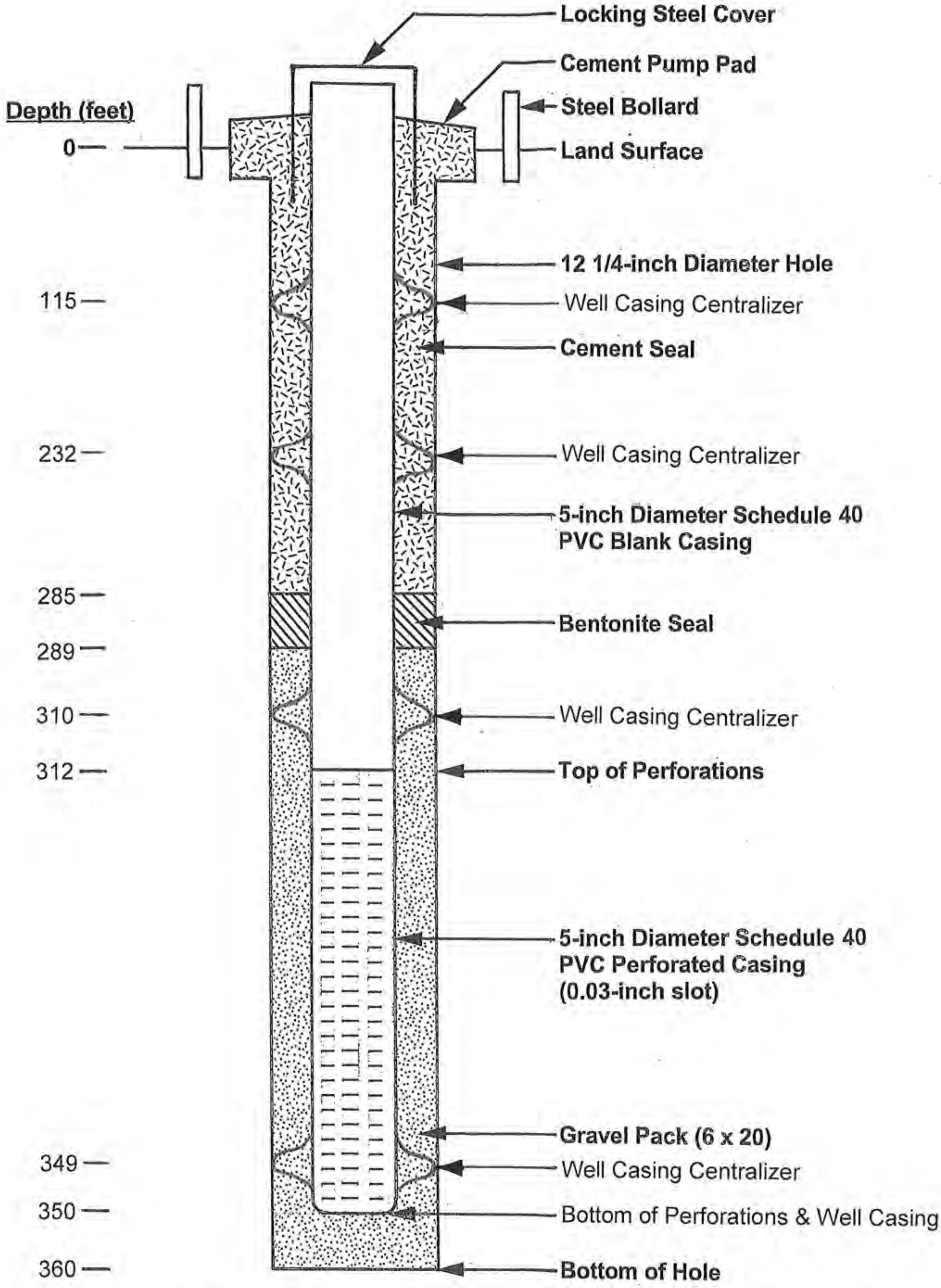
ATTACHMENT C
WELL COMPLETION DIAGRAMS



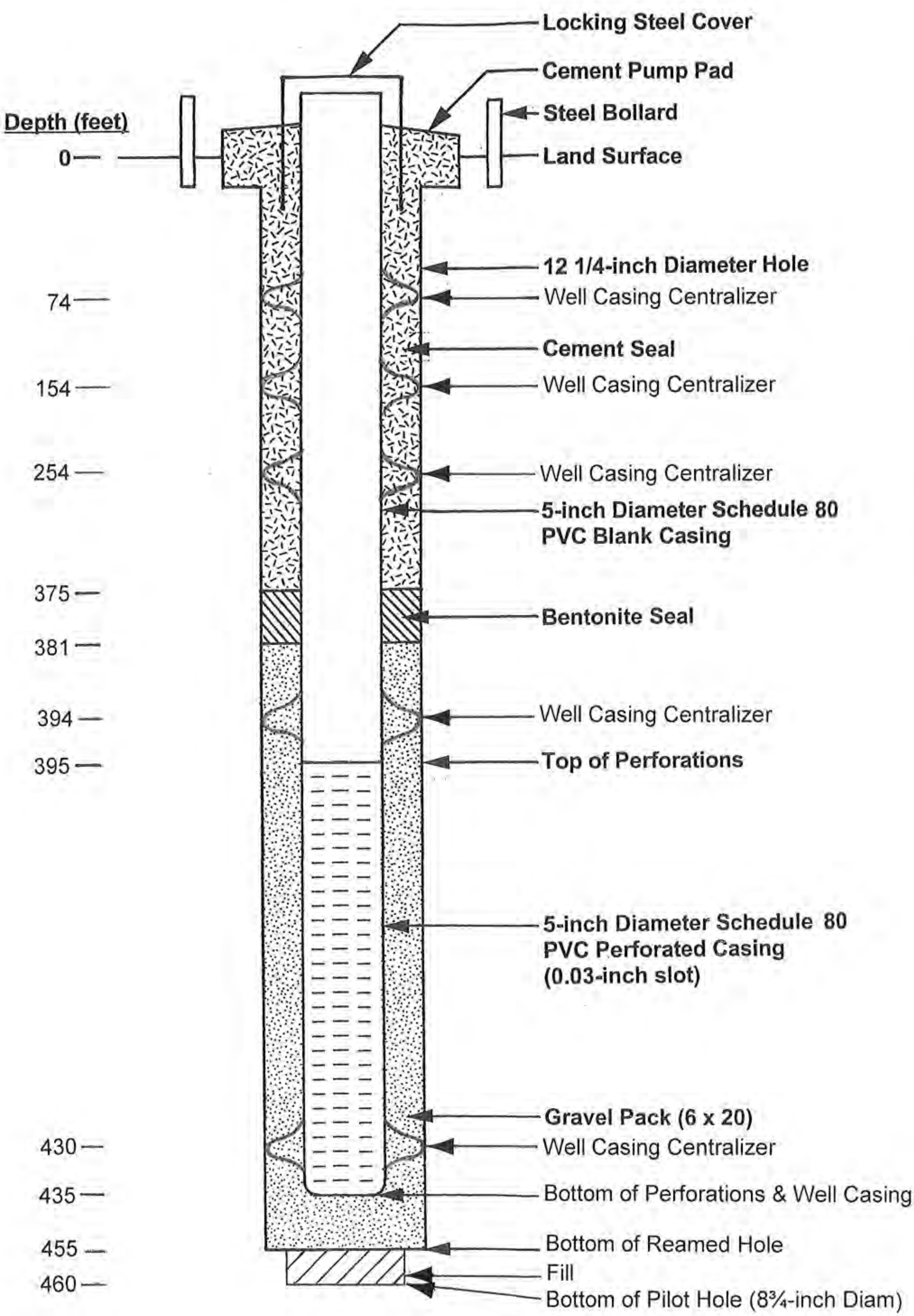
SCHEMATIC DIAGRAM FOR DEEP MONITOR WELL RTH-7D
AT THE RACE TRACK HILL FACILITY



SCHEMATIC DIAGRAM FOR DEEP MONITOR WELL RTH-8D
AT THE RACE TRACK HILL FACILITY



SCHEMATIC DIAGRAM FOR DEEP MONITOR WELL RTH-9D
AT THE RACE TRACK HILL FACILITY



SCHEMATIC DIAGRAM FOR DEEP MONITOR WELL C-1D
AT PLANT-C

ATTACHMENT D
WELL COMPLETION REPORTS

TRIPLICATE
Owner's Copy

Page 1 of 1

STATE OF CALIFORNIA
WELL COMPLETION REPORT
Refer to Instruction Pamphlet

No. EO25666

DWR USE ONLY — DO NOT FILL IN
STATE WELL NO./STATION NO.
LATITUDE LONGITUDE
APN/TRS/OTHER

Owner's Well No. RTH #7D
Date Work Began 2/5/2015, Ended 2/19/2015
Local Permit Agency KERN COUNTY HEALTH
Permit No. WP15779 Permit Date 12/30/2014

GEOLOGIC LOG

ORIENTATION (✓) ✓ VERTICAL ___ HORIZONTAL ___ ANGLE ___ (SPECIFY)
DRILLING METHOD ROTARY FLUID WATER

DEPTH FROM SURFACE Ft. to	Ft.	DESCRIPTION (Describe material, grain, size, color, etc.)
0	80	BROWN CLAY, MEDIUM/COARSE SAND,
		SOME SMALL GRAVEL
80	100	SILTY GRAY CLAY, SOME MEDIUM SAND
100	160	SILTY GRAY CLAY, MEDIUM AND AND GRAVEL
160	200	SILTY GRAY CLAY, SOME MEDIUM SAND
200	240	GRAY CLAY, MEDIUM/FINE SANDS
240	280	MEDIUM/COARSE SAND GRAVEL
280	360	MEDIUM/COARSE SAND, GRAVEL, ROCK

TOTAL DEPTH OF BORING 360 (Feet)
TOTAL DEPTH OF COMPLETED WELL 360 (Feet)

WELL OWNER

Name VALLEY WATER MANAGEMENT
Mailing Address 7500 MEANY AVE.
BAKERSFIELD CA 93308
CITY STATE ZIP

WELL LOCATION

Address S OF 178 ON COMMANCHE ROAD
City BAKERSFIELD CA 93306
County KERN
APN Book 387 Page 060 Parcel 03
Township 29 S Range 29 Section 24
Latitude ___ DEG. MIN. SEC. Longitude ___ DEG. MIN. SEC.

LOCATION SKETCH

NORTH
WEST EAST
SOUTH

Illustrate or Describe Distance of Well from Roads, Buildings, Fences, Rivers, etc. and attach a map. Use additional paper if necessary. PLEASE BE ACCURATE & COMPLETE.

ACTIVITY (✓)

✓ NEW WELL
MODIFICATION/REPAIR
___ Deepen
___ Other (Specify)
___ DESTROY (Describe Procedures and Materials Under "GEOLOGIC LOG")

PLANNED USES (✓)

WATER SUPPLY
___ Domestic ___ Public
___ Irrigation ___ Industrial
MONITORING ✓
TEST WELL ___
CATHODIC PROTECTION ___
HEAT EXCHANGE ___
DIRECT PUSH ___
INJECTION ___
VAPOR EXTRACTION ___
SPARGING ___
REMEDIATION ___
OTHER (SPECIFY) ___

WATER LEVEL & YIELD OF COMPLETED WELL

DEPTH TO FIRST WATER ___ (Ft.) BELOW SURFACE
DEPTH OF STATIC WATER LEVEL ___ (Ft.) & DATE MEASURED ___
ESTIMATED YIELD * ___ (GPM) & TEST TYPE AIR LIFT
TEST LENGTH 4 (Hrs.) TOTAL DRAWDOWN ___ (Ft.)
May not be representative of a well's long-term yield.

CASING (S)

DEPTH FROM SURFACE Ft. to	Ft.	BORE-HOLE DIA. (Inches)	BLANK	SCREEN	CON-DUCTOR	FILL PIPE	MATERIAL / GRADE	INTERNAL DIAMETER (Inches)	GAUGE OR WALL THICKNESS	SLOT SIZE IF ANY (Inches)
0	280	12 1/4"	✓				PVC	5"	SCH 40	
280	330	12 1/4"		✓			PVC	5"	SCH 40	.030

ANNULAR MATERIAL

DEPTH FROM SURFACE Ft. to	Ft.	CE-MENT (✓)	BEN-TONITE (✓)	FILL (✓)	FILTER PACK (TYPE/SIZE)
0	220	✓			10.5 SACK SA
220	225		✓		
225	340			✓	6X20 GRAVEL

ATTACHMENTS (✓)

___ Geologic Log
___ Well Construction Diagram
___ Geophysical Log(s)
___ Soil/Water Chemical Analysis
___ Other
ATTACH ADDITIONAL INFORMATION, IF IT EXISTS.

CERTIFICATION STATEMENT

I, the undersigned, certify that this report is complete and accurate to the best of my knowledge and belief.
NAME BRADLEY & SONS
(PERSON, FIRM, OR CORPORATION) (TYPED OR PRINTED)
3625 S. HIGHLAND DEL REY CA 93616
ADDRESS CITY STATE ZIP
Signed [signature] 02/25/15 414178
WELL DRILLER/AUTHORIZED REPRESENTATIVE DATE SIGNED C-57 LICENSE NUMBER

DWR 188 REV. 11-97 IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM

TRIPLICATE
Owner's Copy
Page 1 of 1

STATE OF CALIFORNIA
WELL COMPLETION REPORT
Refer to Instruction Pamphlet
No. EO252667

DWR USE ONLY — DO NOT FILL IN
STATE WELL NO./STATION NO.
LATITUDE LONGITUDE
APN/TRS/OTHER

Owner's Well No. RTH 8D
Date Work Began 1/26/2015, Ended 2/4/2015
Local Permit Agency ENVIRO HEALTH, KERN CTY
Permit No. WP15777 Permit Date 12/16/2014

GEOLOGIC LOG

ORIENTATION (✓) ✓ VERTICAL ___ HORIZONTAL ___ ANGLE ___ (SPECIFY)
DRILLING METHOD ROTARY FLUID WATER

DEPTH FROM SURFACE Ft.	to Ft.	DESCRIPTION Describe material, grain, size, color, etc.
0	20	COARSE SAND, GRAVEL
20	40	COARSE SAND, CLAY
40	60	COARSE/MEDIUM SAND AND GRAVEL
60	80	COARSE SAND, SOME GRAVEL, TAN CLAY
80	120	COARSE SANDY GRAVEL
120	200	CLAY, GRAVEL
200	220	HARD BLACK GRAY CLAY
220	250	TAN CLAY, GRAVEL

TOTAL DEPTH OF BORING 250 (Feet)
TOTAL DEPTH OF COMPLETED WELL 250 (Feet)

WELL OWNER

Name VALLEY WATER MANAGEMENT
Mailing Address 7500 MEANY AVE
BAKERSFIELD CA 93308
CITY STATE ZIP

WELL LOCATION

Address S OF 178 ON COMMANCHE ROAD
City BAKERSFIELD CA 93306
County KERN
APN Book 387 Page 060 Parcel 03
Township 29 S Range 29 E Section 24
Latitude ___ DEG. MIN. SEC. Longitude ___ DEG. MIN. SEC.

LOCATION SKETCH

NORTH
WEST EAST
SOUTH

Illustrate or Describe Distance of Well from Roads, Buildings, Fences, Rivers, etc. and attach a map. Use additional paper if necessary. PLEASE BE ACCURATE & COMPLETE.

ACTIVITY (✓)

✓ NEW WELL
MODIFICATION/REPAIR
___ Deepen
___ Other (Specify)
___ DESTROY (Describe Procedures and Materials Under "GEOLOGIC LOG")

PLANNED USES (✓)

WATER SUPPLY
___ Domestic ___ Public
✓ Irrigation ___ Industrial
MONITORING ✓
TEST WELL ___
CATHODIC PROTECTION ___
HEAT EXCHANGE ___
DIRECT PUSH ___
INJECTION ___
VAPOR EXTRACTION ___
SPARGING ___
REMEDIATION ___
OTHER (SPECIFY) ___

WATER LEVEL & YIELD OF COMPLETED WELL

DEPTH TO FIRST WATER ___ (Ft.) BELOW SURFACE
DEPTH OF STATIC WATER LEVEL ___ (Ft.) & DATE MEASURED ___
ESTIMATED YIELD * ___ (GPM) & TEST TYPE AIR LIFT
TEST LENGTH 4 (Hrs.) TOTAL DRAWDOWN ___ (Ft.)
May not be representative of a well's long-term yield.

CASING (S)

DEPTH FROM SURFACE Ft.	to Ft.	BORE-HOLE DIA. (Inches)	BLANK	SCREEN	CON-DUCTOR	FILL PIPE	MATERIAL / GRADE	INTERNAL DIAMETER (Inches)	GAUGE OR WALL THICKNESS	SLOT SIZE IF ANY (Inches)
0	190	12 1/4"	✓				PVC	5"	SCH 40	
190	210	12 1/4"		✓			PVC	5"	SCH 40	.030

ANNULAR MATERIAL

DEPTH FROM SURFACE Ft.	to Ft.	CE-MENT (✓)	BEN-TONITE (✓)	FILL (✓)	FILTER PACK (TYPE/SIZE)
0	163	✓			10.5 SACK
163	168		✓		
168	211			✓	6 X 20 SAND
211	219		✓		

ATTACHMENTS (✓)

___ Geologic Log
___ Well Construction Diagram
___ Geophysical Log(s)
___ Soil/Water Chemical Analysis
___ Other ___

ATTACH ADDITIONAL INFORMATION, IF IT EXISTS.

CERTIFICATION STATEMENT

I, the undersigned, certify that this report is complete and accurate to the best of my knowledge and belief.
NAME BRADLEY & SONS
(PERSON, FIRM, OR CORPORATION) (TYPED OR PRINTED)
3625 S. HIGHLAND DEL REY CA 93616
ADDRESS CITY STATE ZIP
Signed ___ 02/25/15 414178
WELL DRILLER/AUTHORIZED REPRESENTATIVE DATE SIGNED C-57 LICENSE NUMBER

DWR 188 REV. 11-97 IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM

TRIPLICATE
Owner's Copy
Page 1 of 1

STATE OF CALIFORNIA
WELL COMPLETION REPORT
Refer to Instruction Pamphlet

No. EO2526682

DWR USE ONLY — DO NOT FILL IN
STATE WELL NO./STATION NO.
LATITUDE LONGITUDE
APN/TRS/OTHER

Owner's Well No. RTH 9D
Date Work Began 1/29/2015, Ended 2/4/2015
Local Permit Agency ENVIRO HEALTH, KERN CTY
Permit No. WP15778 Permit Date 12/30/2014

GEOLOGIC LOG

ORIENTATION (✓) ✓ VERTICAL ___ HORIZONTAL ___ ANGLE ___ (SPECIFY)
DRILLING METHOD ROTARY FLUID WATER

DEPTH FROM SURFACE Ft.	to Ft.	DESCRIPTION (Describe material, grain, size, color, etc.)
0	60	CLAY, GRAVEL, COARSE SAND
60	120	TAN CLAY, SMALL GRAVEL, COARSE SAND
120	140	CLAY, MEDIUM/COARSE SAND
140	160	TAN CLAY, SOME MEDIUM SAND
160	200	TAN CLAY, SOME MEDIM SAND AND GRAVEL
200	220	TAN CLAY, MEDIUM SAND
220	280	ROCK, CLAY
280	360	CLAY, SOME GRAVEL, MEDIUM SAND

TOTAL DEPTH OF BORING 350 (Feet)
TOTAL DEPTH OF COMPLETED WELL 350 (Feet)

WELL OWNER

Name VALLEY WATER MANAGEMENT
Mailing Address
CITY STATE ZIP

WELL LOCATION

Address S OF 178 ON COMMANCHE ROAD
City BAKERSFIELD CA 93306
County KERN
APN Book 387 Page 060 Parcel 03
Township 29 S Range 29 E Section 24
Latitude DEG. MIN. SEC. DEG. MIN. SEC.

LOCATION SKETCH

NORTH
WEST
EAST
SOUTH

Illustrate or Describe Distance of Well from Roads, Buildings, Fences, Rivers, etc. and attach a map. Use additional paper if necessary. PLEASE BE ACCURATE & COMPLETE.

ACTIVITY (✓)

✓ NEW WELL
MODIFICATION/REPAIR
Deepen
Other (Specify)
DESTROY (Describe Procedures and Materials Under "GEOLOGIC LOG")

PLANNED USES (✓)
WATER SUPPLY
___ Domestic ___ Public
✓ Irrigation ___ Industrial
MONITORING ✓
TEST WELL
CATHODIC PROTECTION
HEAT EXCHANGE
DIRECT PUSH
INJECTION
VAPOR EXTRACTION
SPARGING
REMEDIATION
OTHER (SPECIFY)

WATER LEVEL & YIELD OF COMPLETED WELL

DEPTH TO FIRST WATER ___ (Ft.) BELOW SURFACE
DEPTH OF STATIC WATER LEVEL ___ (Ft.) & DATE MEASURED
ESTIMATED YIELD * ___ (GPM) & TEST TYPE AIR LIFT
TEST LENGTH 4 (Hrs.) TOTAL DRAWDOWN ___ (Ft.)
May not be representative of a well's long-term yield.

CASING (S)

DEPTH FROM SURFACE Ft.	to Ft.	BORE-HOLE DIA. (Inches)	BLANK	SCREEN	CON-DUCTOR	FILL PIPE	MATERIAL / GRADE	INTERNAL DIAMETER (Inches)	GAUGE OR WALL THICKNESS	SLOT SIZE IF ANY (Inches)
0	310	12 1/4"	✓				PVC	5"	SCH 40	
310	350	12 1/4"		✓			PVC	5"	SCH 40	.030

ANNULAR MATERIAL

DEPTH FROM SURFACE Ft.	to Ft.	CE-MENT (✓)	BEN-TONITE (✓)	FILL (✓)	FILTER PACK (TYPE/SIZE)
0	285	✓			10.2 SACK
285	290				
290	350			✓	6 X 20 GRAVE

ATTACHMENTS (✓)

___ Geologic Log
___ Well Construction Diagram
___ Geophysical Log(s)
___ Soil/Water Chemical Analysis
___ Other
ATTACH ADDITIONAL INFORMATION, IF IT EXISTS.

CERTIFICATION STATEMENT

I, the undersigned, certify that this report is complete and accurate to the best of my knowledge and belief.
NAME BRADLEY & SONS
(PERSON, FIRM, OR CORPORATION) (TYPED OR PRINTED)
3625 S. HIGHLAND DEL REY CA 93616
ADDRESS CITY STATE ZIP
Signed [signature] 02/25/15 414178
WELL DRILLER/AUTHORIZED REPRESENTATIVE DATE SIGNED C-57 LICENSE NUMBER

DWR 188 REV. 11-97
IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM

TRIPLICATE
Owner's Copy

Page 1 of 1

STATE OF CALIFORNIA

WELL COMPLETION REPORT

Refer to Instruction Pamphlet

No. **EO252670**

DWR USE ONLY — DO NOT FILL IN

STATE WELL NO./STATION NO.

LATITUDE LONGITUDE

APN/TRS/OTHER

Owner's Well No. C1-D

Date Work Began 2/5/2015, Ended 2/23/2015

Local Permit Agency KERN CTY PUBLIC HEALTH

Permit No. WP15776 Permit Date 12/30/2014

GEOLOGIC LOG

ORIENTATION (✓) ✓ VERTICAL ___ HORIZONTAL ___ ANGLE ___ (SPECIFY)

DRILLING METHOD ROTARY FLUID WATER

DEPTH FROM SURFACE Ft.	to Ft.	DESCRIPTION Describe material, grain, size, color, etc.
0	20	LARGE ROCK, TOPSOIL, COARSE SAND
20	60	LARGE GRAVEL, COARSE SAND, RED CLAY
60	160	SOME GRAVEL, COARSE SAND, CLAY
160	240	SOME SMALL GRAVEL, COARSE/MEDIUM SAND , BROWN CLAY
240	300	BROWN CLAY, MEDIUM/COARSE SAND
300	380	GRAVEL, BROWN CLAY, MEDIUM SAND
380	460	BROWN CLAY, MEDIUM/FINE SAND

TOTAL DEPTH OF BORING 455 (Feet)

TOTAL DEPTH OF COMPLETED WELL 455 (Feet)

WELL OWNER

Name VALLEY WATER MANAGEMENT

Mailing Address 7500 MEANY AVENUE

BAKERSFIELD CA 93308

CITY STATE ZIP

WELL LOCATION

Address S. OF 178 ON COMMANCHE ROAD

City BAKERSFIELD CA 93306

County KERN

APN Book 388 Page 050 Parcel 25

Township 29 S Range 29 E Section 34

Latitude ___ DEG. MIN. SEC. Longitude ___ DEG. MIN. SEC.

LOCATION SKETCH

NORTH

WEST EAST

SOUTH

Illustrate or Describe Distance of Well from Roads, Buildings, Fences, Rivers, etc. and attach a map. Use additional paper if necessary. **PLEASE BE ACCURATE & COMPLETE.**

ACTIVITY (✓)

✓ NEW WELL

MODIFICATION/REPAIR
___ Deepen
___ Other (Specify)

___ DESTROY (Describe Procedures and Materials Under "GEOLOGIC LOG")

PLANNED USES (✓)

WATER SUPPLY
___ Domestic ___ Public
___ Irrigation ___ Industrial

MONITORING ✓
TEST WELL ___
CATHODIC PROTECTION ___
HEAT EXCHANGE ___
DIRECT PUSH ___
INJECTION ___
VAPOR EXTRACTION ___
SPARGING ___
REMEDIATION ___
OTHER (SPECIFY) ___

WATER LEVEL & YIELD OF COMPLETED WELL

DEPTH TO FIRST WATER ___ (Ft.) BELOW SURFACE

DEPTH OF STATIC WATER LEVEL ___ (Ft.) & DATE MEASURED ___

ESTIMATED YIELD * ___ (GPM) & TEST TYPE AIR LIFT

TEST LENGTH 21 (Hrs.) TOTAL DRAWDOWN ___ (Ft.)

May not be representative of a well's long-term yield.

CASING (S)

DEPTH FROM SURFACE Ft.	to Ft.	BORE-HOLE DIA. (Inches)	BLANK	SCREEN	CON-DUCTOR	FILL PIPE	MATERIAL / GRADE	INTERNAL DIAMETER (Inches)	GAUGE OR WALL THICKNESS	SLOT SIZE IF ANY (Inches)
0	395'	12 1/4"	✓				PVC	5"	SCH 80	
395	435'	12 1/4"		✓			PVC	5"	SCH 80	.030

ANNULAR MATERIAL

DEPTH FROM SURFACE Ft.	to Ft.	CE-MENT (✓)	BEN-TONITE (✓)	FILL (✓)	FILTER PACK (TYPE/SIZE)
0	375	✓			10.5 SACK SA
375	380		✓		
380	455'			✓	GRAVEL

ATTACHMENTS (✓)

___ Geologic Log
___ Well Construction Diagram
___ Geophysical Log(s)
___ Soil/Water Chemical Analysis
___ Other

ATTACH ADDITIONAL INFORMATION, IF IT EXISTS.

CERTIFICATION STATEMENT

I, the undersigned, certify that this report is complete and accurate to the best of my knowledge and belief.

NAME BRADLEY & SONS
(PERSON, FIRM, OR CORPORATION) (TYPED OR PRINTED)

3625 S. HIGHLAND — DEL REY — CA — 93616
ADDRESS CITY STATE ZIP

Signed ___ WELL DRILLER/AUTHORIZED REPRESENTATIVE — 02/25/15 DATE SIGNED — 414178 C-57 LICENSE NUMBER

DWR 188 REV. 11-97

IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM

ATTACHMENT E

WELL SURVEY DATA

VALLEY WATER MANAGEMENT
GROUNDWATER MONITORING WELLS
RACETRACK HILL
SECTION 24 29/29

WELL	ELEV	DESC	DATUM	NORTHING	EASTING
RTH 7D	1061.83	TOP PVC CASING	NAD83	2328450.5330	6316615.0770
	1059.62	TOP WELL PAD			
RTH 8D	874.69	TOP PVC CASING	NAD83	2331694.4730	6318145.7090
	872.94	TOP WELL PAD			
RTH 9D	1025.15	TOP PVC CASING	NAD83	2330628.4350	6316159.4270
	1022.51	TOP WELL PAD			
C PLANT 1D	635.53	TOP PVC CASING	NAD83	2316433.8390	6305097.6380
	634.03	TOP WELL PAD			

PREPARED BY:
DEE JASPAR & ASSOCIATES, INC.

DATE OF SURVEY:
March 20, 2015

VALLEY WATER MANAGEMENT
GROUNDWATER MONITORING WELLS
RACETRACK HILL
SECTION 24 29/29

BENCHMARK:

NGS MONUMENT BRASS CAP - PID "FU0159"

1991 ELEV = 785.40

HORIZONTAL DATUM NAD83, ZONE 5

PREPARED BY:
DEE JASPAR & ASSOCIATES, INC.

DATE OF SURVEY:
March 20, 2015

ATTACHMENT F
FIELD MEASUREMENTS FOR WELL SAMPLING

VALLEY WATER MANAGEMENT CO.
FIELD MEASUREMENTS FOR RTH-7D

Date: 3/16/15

Static Water Level: 206.8 feet below top of PVC
206.8-2.2 feet = 204.6 feet below land surface

Perforated Interval: 282-330 feet
One Well Volume: (330-204.6 ft) x 1.02 gal/ft = 127.9 gallons
Three Well Volumes: 127.9 gal x 3 = 384 gallons
Average Pumping Rate: 4.3 gpm

Time	Temp (°F)	Elec. Cond. (µmhos/ cm @ 25°C)	pH	Appearance	Pumping Level (ft)
2:50PM	Began pumping				
2:51	76	5,080	6.5	Clear w/H_2S odor	
2:52					249.0
2:54	76	3,440	8.1	Clear	
2:56	76	3,260	11.1	Milky white	267.8
3:00	76	3,220	10.3	Milky white with organic odor	
3:02					314.0
3:05	Pumping stopped				
3:16	Began pumping			Brown Turbid	
3:17					280.7
3:18					282.5
3:19	78	5,130	6.4	Milky white	
3:24					283.1
3:25	79	5,330	6.4	Milky white	
3:30	79	5,410	6.3	Milky white with H_2S odor	284.0
3:35	79	5,410	6.4	Milky white	
3:40	79	5,340	6.4	Milky white	285.1
3:45	79	5,330	6.4	Milky white	
3:50	79	5,370	6.4	Milky white	286.2
3:55	79	5,370	6.4	Milky white	
4:00	79	5,320	6.4	Milky white	288.7
4:09					291.0
4:10	79	5,310	6.4	Milky white	
4:20	79	5,310	6.4	Milky white	
4:21					297.9
4:28	79	5,210	6.5	Milky white	

Samples collected at 4:30PM

VALLEY WATER MANAGEMENT CO.
FIELD MEASUREMENTS FOR RTH-8D

Date: 3/11/15

Static Water Level: 86.9 feet below top of PVC
86.9-1.8 feet = 85.1 feet below land surface

Perforated Interval: 191-210 feet
One Well Volume: (210-85.1 ft) x 1.02 gal/ft = 127.4 gallons
Three Well Volumes: 127.4 gal x 3 = 382 gallons
Average Pumping Rate: 9 gpm

Time	Temp (°F)	Elec. Cond. (µmhos/ cm @ 25°C)	pH	Appearance	Pumping Level (ft)
1:27PM	Began pumping				
1:28	71	6,340	6.6	Clear	
1:30					104.0
1:31	71	6,440	6.6	Clear	
1:32					109.6
1:33	71	6,450	6.6	Clear	
1:35	71	6,450	6.6	Clear	
1:39	71	6,470	6.7	Clear	
1:41	71	6,450	6.6	Clear	
1:42					113.2
1:46	71	6,420	6.7	Clear	
1:48					113.8
1:51	71	6,470	6.7	Clear	
1:53					114.0
1:56	71	6,430	6.6	Clear	
1:58					114.1
2:01	71	6,380	6.6	Clear	
2:03					114.3
2:07	71	6,460	6.6	Clear	

Sample collected at 2:09PM

VALLEY WATER MANAGEMENT CO.
FIELD MEASUREMENTS FOR RTH-9D

Date: 3/17/15

Static Water Level: 225.3 feet below top of PVC
225.3-2.6 feet = 222.7 feet below land surface

Perforated Interval: 312-350 feet
One Well Volume: (350-222.7 ft) x 1.02 gal/ft = 129.9 gallons
Three Well Volumes: 129.9 gal x 3 = 390 gallons
Average Pumping Rate: 3.2 gpm

Time	Temp (°F)	Elec. Cond. (µmhos/ cm @ 25°C)	pH	Appearance	Pumping Level (ft)
9:11AM Began pumping					
9:12				Brown muddy	239.4
9:14	76	3,180	11.8		
9:15				Clear	270.9
9:17	76	3,460	11.7	Clear	
9:20	76	3,180	11.4	Clear w/air	
9:21					289.8
9:25	76	2,930	9.4	Clear w/air	
9:26					301.9
9:30	76	2,930	10.7	Slightly turbid	
9:31					305.9
9:35	76	2,980	9.8	Slightly turbid	
9:40	77	3,480	8.1	Slightly turbid	
9:41					305.2
9:45	77	3,640	7.6	Slightly turbid	
9:50 Pumping stopped					
10:20 Began pumping					
10:26	76	3,760	7.3	Slightly turbid w/air	
10:30	77	3,750	7.3	Slightly turbid w/air	
10:31					250.5
10:40	77	3,910	7.1	Clear w/air	
10:42					255.3
10:50	77	3,910	7.1	Clear w/air	
11:00	77	3,870	7.0	Clear w/air	
11:01					257.9
11:10	77	3,920	7.0	Clear w/air	
11:20	77	3,920	7.0	Clear w/air	
11:21					258.3
11:30	77	3,960	7.0	Clear w/air	
11:40					258.8
11:43	77	3,940	6.9	Clear w/air	

Samples collected at 11:46AM

VALLEY WATER MANAGEMENT CO.
FIELD MEASUREMENTS FOR C-1D

Date: 3/17/15

Static Water Level: 298.4 feet below top of PVC
298.4-1.8 feet = 296.6 feet below land surface

Perforated Interval: 395-435 feet
One Well Volume: (435-296.6 ft) x 1.02 gal/ft = 141.2 gallons
Three Well Volumes: 141.2 gal x 3 = 424 gallons
Average Pumping Rate: 5.7 gpm

Time	Temp (°F)	Elec. Cond. (µmhos/ cm @ 25°C)	pH	Appearance	Pumping Level (ft)
7:15AM	Began pumping				
7:16					307.0
7:17	78	893	6.7	Clear with air and H_2S odor	
7:18					309.1
7:20	79	1,096	6.8	Milky white with H_2S odor	
7:24	Pumping stopped				
7:30	Began pumping				
7:32					304.5
7:35	79	1,267	6.9	Milky white with H_2S odor	
7:38					304.9
7:40	80	1,268	7.0	Milky white with H_2S odor	
7:46	80	1,268	7.0	Milky white with H_2S odor	304.8
7:50	80	1,272	7.0	Milky white with H_2S odor	305.0
7:55	79	1,299	7.0	Milky white with H_2S odor	
8:00	80	1,300	7.1	Milky white with H_2S odor	
8:03					305.1
8:05	79	1,316	7.1	Clear with air and H_2S odor	
8:10	79	1,307	7.1	Clear with air and H_2S odor	
8:12					305.1
8:15	79	1,321	7.1	Clear with air and H_2S odor	

Continued:

VALLEY WATER MANAGEMENT CO.
FIELD MEASUREMENTS FOR C-1D
(Continued:)

Date: 3/17/15

Static Water Level: 298.4 feet below top of PVC
298.4-1.8 feet = 296.6 feet below land surface

Perforated Interval: 395-435 feet
One Well Volume: (435-296.6 ft) x 1.02 gal/ft = 141.2 gallons
Three Well Volumes: 141.2 gal x 3 = 424 gallons
Average Pumping Rate: 5.7 gpm

Time	Temp (°F)	Elec. Cond. (µmhos/ cm @ 25°C)	pH	Appearance	Pumping Level (ft)
8:20AM	79	1,318	7.1	Clear with air and H_2S odor	
8:25	80	1,333	7.1	Clear with air and H_2S odor	
8:26					305.1
8:30	80	1,318	7.1	Clear with air and H_2S odor	
8:34	80	1,319	7.1	Clear with air and H_2S odor	

Samples collected at 8:35AM

ATTACHMENT G
LABORATORY ANALYTICAL SHEETS

March 20, 2015

Kenneth D. Schmidt & Assoc.
3701 Pegasus Dr., Suite #112
Bakersfield, CA 93308

Lab ID : VI 1540850-001
Customer ID : 4-17878

Sampled On : March 16, 2015-16:30
Sampled By : Jim Angell
Received On : March 18, 2015-11:45
Matrix : Ag Water

Description : RTH-7D
Project : Race Track Hill

Sample Result - Inorganic

Constituent	Result	PQL	Units	Note	Sample Preparation		Sample Analysis	
					Method	Date/ID	Method	Date/ID
Irrigation Suit[P:1]								
Total Hardness as CaCO3	1760	--	mg/L		200.7	03/19/15:203223	200.7	03/19/15:204278
Calcium	534	1	mg/L		200.7	03/19/15:203223	200.7	03/19/15:204278
Magnesium	104	1	mg/L		200.7	03/19/15:203223	200.7	03/19/15:204278
Potassium	35	1	mg/L		200.7	03/19/15:203223	200.7	03/19/15:204278
Sodium	411	1	mg/L		200.7	03/19/15:203223	200.7	03/19/15:204278
Total Cations	54.0	--	meq/L		200.7	03/19/15:203223	200.7	03/19/15:204278
Boron	0.3	0.1	mg/L		200.7	03/19/15:203223	200.7	03/19/15:204278
Copper	ND	10	ug/L		200.7	03/19/15:203223	200.7	03/19/15:204278
Iron	540	30	ug/L		200.7	03/19/15:203223	200.7	03/19/15:204278
Manganese	1130	10	ug/L		200.7	03/19/15:203223	200.7	03/19/15:204278
Zinc	60	20	ug/L		200.7	03/19/15:203223	200.7	03/19/15:204278
Gypsum Requirement	0.0	--	Tons/AF		200.7	03/19/15:203223	200.7	03/19/15:204278
SAR	4.3	--	--		200.7	03/19/15:203223	200.7	03/19/15:204278
Total Alkalinity	260	10	mg/L		2320B	03/18/15:203166	2320B	03/18/15:204307
Hydroxide	ND	10	mg/L		2320B	03/18/15:203166	2320B	03/18/15:204307
Carbonate	ND	10	mg/L		2320B	03/18/15:203166	2320B	03/18/15:204307
Bicarbonate	320	10	mg/L		2320B	03/18/15:203166	2320B	03/18/15:204307
Sulfate	910	40*	mg/L		300.0	03/18/15:203226	300.0	03/18/15:204217
Chloride	1250	20*	mg/L		300.0	03/18/15:203226	300.0	03/18/15:204217
Nitrate	0.4	0.4	mg/L		4500NO3F	03/19/15:203243	4500NO3F	03/19/15:204261
Nitrate Nitrogen	ND	0.1	mg/L		4500NO3F	03/19/15:203243	4500NO3F	03/19/15:204261
Fluoride	ND	0.1	mg/L		300.0	03/18/15:203226	300.0	03/18/15:204217
Total Anions	59.5	--	meq/L		2320B	03/18/15:203166	2320B	03/18/15:204307
pH	6.6	--	units		4500-H B	03/19/15:203242	4500HB	03/19/15:204225
E. C.	5420	1	umhos/cm		2510B	03/19/15:203224	2510B	03/19/15:204206
TDS by Summation	3560	--	mg/L		200.7	03/19/15:203223	200.7	03/19/15:204278
Wet Chemistry[P:1]								
Solids, Total Dissolved (TDS)	3900	20*	mg/L		2540CE	03/18/15:203197	2540C	03/19/15:204208

ND=Non-Detected. PQL=Practical Quantitation Limit. Containers: (AVT) Amber VOA TFE-Cap, (P) Plastic Preservatives: H_2SO_4 pH < 2 ‡Surrogate. * PQL adjusted for dilution.

Corporate Offices & Laboratory
853 Corporation Street
Santa Paula, CA 93060
TEL: (805)392-2000
Env FAX: (805)525-4172 / Ag FAX: (805)392-2063
CA ELAP Certification No. 1573

Office & Laboratory
2500 Stagecoach Road
Stockton, CA 95215
TEL: (209)942-0182
FAX: (209)942-0423
CA ELAP Certification No. 1563

Office & Laboratory
563 E. Lindo Avenue
Chico, CA 95926
TEL: (530)343-5818
FAX: (530)343-3807
CA ELAP Certification No. 2670

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3442 Empresa Drive, Suite D
San Luis Obispo, CA 93401
TEL: (805)783-2940
FAX: (805)783-2912
CA ELAP Certification No. 2775

Office & Laboratory
9415 W. Goshen Avenue
Visalia, CA 93291
TEL: (559)734-9473
FAX: (559)734-8435
CA ELAP Certification No. 2810

March 20, 2015

Kenneth D. Schmidt & Assoc.
3701 Pegasus Dr., Suite #112
Bakersfield, CA 93308

Lab ID : VI 1540850-001
Customer ID : 4-17878

Sampled On : March 16, 2015-16:30
Sampled By : Jim Angell
Received On : March 18, 2015-11:45
Matrix : Ag Water

Description : RTH-7D
Project : Race Track Hill

Sample Result - Organic

Constituent	Result	PQL	Units	Note	Sample Preparation		Sample Analysis	
					Method	Date/ID	Method	Date/ID
TOCAVT:T4								
TOC	0.5	0.5	mg/L		5310C	03/18/15:203198	5310C	03/18/15:204236

ND=Non-Detected. PQL=Practical Quantitation Limit. Containers: (AVT) Amber VOA TFE-Cap, (P) Plastic Preservatives: H2SO4 pH < 2 ‡Surrogate. * PQL adjusted for dilution.

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CA ELAP Certification No. 2670

Office & Laboratory
3442 Empresa Drive, Suite D
San Luis Obispo, CA 93401
TEL: (805)783-2940
FAX: (805)783-2912
CA ELAP Certification No. 2775

Office & Laboratory
9415 W. Goshen Avenue
Visalia, CA 93291
TEL: (559)734-9473
FAX: (559)734-8435
CA ELAP Certification No. 2810

March 19, 2015

Lab ID : VI 1540793-001
Customer ID : 4-17878

Kenneth D. Schmidt & Assoc.
3701 Pegasus Dr., Suite #112
Bakersfield, CA 93308

Sampled On : March 11, 2015-14:09
Sampled By : James Angell
Received On : March 12, 2015-11:00
Matrix : Water

Description : RTH-8D
Project : Race Track Hill

Sample Result - Inorganic

Constituent	Result	PQL	Units	Note	Sample Preparation Method	Sample Preparation Date/ID	Sample Analysis Method	Sample Analysis Date/ID
Irrigation Suit[P:1]								
Total Hardness as CaCO3	1940	--	mg/L		200.7	03/13/15:202987	200.7	03/13/15:203997
Calcium	514	1	mg/L		200.7	03/13/15:202987	200.7	03/13/15:203997
Magnesium	161	1	mg/L		200.7	03/13/15:202987	200.7	03/13/15:203997
Potassium	14	1	mg/L		200.7	03/13/15:202987	200.7	03/13/15:203997
Sodium	376	1	mg/L		200.7	03/13/15:202987	200.7	03/13/15:203997
Total Cations	55.6	--	meq/L		200.7	03/13/15:202987	200.7	03/13/15:203997
Boron	9.1	0.1	mg/L		200.7	03/13/15:202987	200.7	03/13/15:203997
Copper	10	10	ug/L		200.7	03/13/15:202987	200.7	03/13/15:203997
Iron	ND	30	ug/L		200.7	03/13/15:202987	200.7	03/13/15:203997
Manganese	110	10	ug/L		200.7	03/13/15:202987	200.7	03/13/15:203997
Zinc	ND	20	ug/L		200.7	03/13/15:202987	200.7	03/13/15:203997
Gypsum Requirement	0.0	--	Tons/AF		200.7	03/13/15:202987	200.7	03/13/15:203997
SAR	3.7	--	--		200.7	03/13/15:202987	200.7	03/13/15:203997
Total Alkalinity	250	10	mg/L		2320B	03/13/15:203002	2320B	03/13/15:204019
Hydroxide	ND	10	mg/L		2320B	03/13/15:203002	2320B	03/13/15:204019
Carbonate	ND	10	mg/L		2320B	03/13/15:203002	2320B	03/13/15:204019
Bicarbonate	310	10	mg/L		2320B	03/13/15:203002	2320B	03/13/15:204019
Sulfate	23	2	mg/L		300.0	03/12/15:202962	300.0	03/13/15:204028
Chloride	2060	20*	mg/L		300.0	03/12/15:202962	300.0	03/13/15:204028
Nitrate	2.7	0.5	mg/L		300.0	03/12/15:202962	300.0	03/13/15:204028
Nitrate Nitrogen	0.6	0.1	mg/L		300.0	03/12/15:202962	300.0	03/13/15:204028
Fluoride	ND	0.1	mg/L		300.0	03/12/15:202962	300.0	03/13/15:204028
Total Anions	63.7	--	meq/L		2320B	03/13/15:203002	2320B	03/13/15:204019
pH	6.6	--	units		4500-H B	03/17/15:203104	4500HB	03/17/15:204064
E. C.	6490	1	umhos/cm		2510B	03/13/15:202985	2510B	03/13/15:203902
TDS by Summation	3460	--	mg/L		200.7	03/13/15:202987	200.7	03/13/15:203997
Wet Chemistry[P:1]								
Solids, Total Dissolved (TDS)	4180	20*	mg/L		2540CE	03/13/15:202959	2540C	03/16/15:204001

ND=Non-Detected. PQL=Practical Quantitation Limit. Containers: (AVT) Amber VOA TFE-Cap, (P) Plastic Preservatives: H2SO4 pH < 2 ‡Surrogate. * PQL adjusted for dilution.

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March 19, 2015

Kenneth D. Schmidt & Assoc.
3701 Pegasus Dr., Suite #112
Bakersfield, CA 93308

Lab ID : VI 1540793-001
Customer ID : 4-17878

Sampled On : March 11, 2015-14:09
Sampled By : James Angell
Received On : March 12, 2015-11:00
Matrix : Water

Description : RTH-8D
Project : Race Track Hill

Sample Result - Organic

Constituent	Result	PQL	Units	Note	Sample Preparation		Sample Analysis	
					Method	Date/ID	Method	Date/ID
TOC[AVT:T4]								
TOC	0.8	0.5	mg/L		5310C	03/18/15:203198	5310C	03/18/15:204236

ND=Non-Detected. PQL=Practical Quantitation Limit. Containers: (AVT) Amber VOA TFE-Cap, (P) Plastic Preservatives: H2SO4 pH < 2 ‡Surrogate. * PQL adjusted for dilution.

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March 20, 2015

Kenneth D. Schmidt & Assoc.
3701 Pegasus Dr., Suite #112
Bakersfield, CA 93308

Lab ID : VI 1540850-003
Customer ID : 4-17878

Sampled On : March 17, 2015-11:46
Sampled By : Jim Angell
Received On : March 18, 2015-11:45
Matrix : Ag Water

Description : RTH-9D
Project : Race Track Hill

Sample Result - Inorganic

Constituent	Result	PQL	Units	Note	Sample Preparation		Sample Analysis	
					Method	Date/ID	Method	Date/ID
Irrigation Suit[P:1]								
Total Hardness as CaCO3	1260	--	mg/L		200.7	03/19/15:203223	200.7	03/19/15:204278
Calcium	464	1	mg/L		200.7	03/19/15:203223	200.7	03/19/15:204278
Magnesium	26	1	mg/L		200.7	03/19/15:203223	200.7	03/19/15:204278
Potassium	17	1	mg/L		200.7	03/19/15:203223	200.7	03/19/15:204278
Sodium	321	1	mg/L		200.7	03/19/15:203223	200.7	03/19/15:204278
Total Cations	39.7	--	meq/L		200.7	03/19/15:203223	200.7	03/19/15:204278
Boron	0.2	0.1	mg/L		200.7	03/19/15:203223	200.7	03/19/15:204278
Copper	ND	10	ug/L		200.7	03/19/15:203223	200.7	03/19/15:204278
Iron	ND	30	ug/L		200.7	03/19/15:203223	200.7	03/19/15:204278
Manganese	790	10	ug/L		200.7	03/19/15:203223	200.7	03/19/15:204278
Zinc	30	20	ug/L		200.7	03/19/15:203223	200.7	03/19/15:204278
Gypsum Requirement	0.0	--	Tons/AF		200.7	03/19/15:203223	200.7	03/19/15:204278
SAR	3.9	--	--		200.7	03/19/15:203223	200.7	03/19/15:204278
Total Alkalinity	170	10	mg/L		2320B	03/18/15:203166	2320B	03/18/15:204307
Hydroxide	ND	10	mg/L		2320B	03/18/15:203166	2320B	03/18/15:204307
Carbonate	ND	10	mg/L		2320B	03/18/15:203166	2320B	03/18/15:204307
Bicarbonate	210	10	mg/L		2320B	03/18/15:203166	2320B	03/18/15:204307
Sulfate	860	20*	mg/L		300.0	03/18/15:203225	300.0	03/18/15:204247
Chloride	820	10*	mg/L		300.0	03/18/15:203225	300.0	03/18/15:204247
Nitrate	1.0	0.5	mg/L		300.0	03/18/15:203225	300.0	03/18/15:204247
Nitrate Nitrogen	0.2	0.1	mg/L		300.0	03/18/15:203225	300.0	03/18/15:204247
Fluoride	ND	0.1	mg/L		300.0	03/18/15:203225	300.0	03/18/15:204247
Total Anions	44.5	--	meq/L		2320B	03/18/15:203166	2320B	03/18/15:204307
pH	7.0	--	units		4500-H B	03/19/15:203242	4500HB	03/19/15:204225
E. C.	4000	1	umhos/cm		2510B	03/19/15:203224	2510B	03/19/15:204206
TDS by Summation	2720	--	mg/L		200.7	03/19/15:203223	200.7	03/19/15:204278
Wet Chemistry[P:1]								
Solids, Total Dissolved (TDS)	2960	20*	mg/L		2540CE	03/18/15:203197	2540C	03/19/15:204208

ND=Non-Detected. PQL=Practical Quantitation Limit. Containers: (AVT) Amber VOA TFE-Cap, (P) Plastic Preservatives: H2SO4 pH < 2 ‡Surrogate. * PQL adjusted for dilution.

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March 20, 2015

Lab ID : VI 1540850-003
Customer ID : 4-17878

Kenneth D. Schmidt & Assoc.
3701 Pegasus Dr., Suite #112
Bakersfield, CA 93308

Sampled On : March 17, 2015-11:46
Sampled By : Jim Angell
Received On : March 18, 2015-11:45
Matrix : Ag Water

Description : RTH-9D
Project : Race Track Hill

Sample Result - Organic

Constituent	Result	PQL	Units	Note	Sample Preparation		Sample Analysis	
					Method	Date/ID	Method	Date/ID
TOCAVT:T4								
TOC	0.5	0.5	mg/L		5310C	03/18/15:203198	5310C	03/19/15:204236

ND=Non-Detected. PQL=Practical Quantitation Limit. Containers: (AVT) Amber VOA TFE-Cap, (P) Plastic Preservatives: H2SO4 pH < 2 ‡Surrogate. * PQL adjusted for dilution.

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March 20, 2015

Kenneth D. Schmidt & Assoc.
3701 Pegasus Dr., Suite #112
Bakersfield, CA 93308

Lab ID : VI 1540850-002
Customer ID : 4-17878

Sampled On : March 17, 2015-08:35
Sampled By : Jim Angell
Received On : March 18, 2015-11:45
Matrix : Ag Water

Description : C-1D
Project : Race Track Hill

Sample Result - Inorganic

Constituent	Result	PQL	Units	Note	Sample Preparation Method	Sample Preparation Date/ID	Sample Analysis Method	Sample Analysis Date/ID
Irrigation Suit P:1								
Total Hardness as CaCO3	326	--	mg/L		200.7	03/19/15:203223	200.7	03/19/15:204278
Calcium	101	1	mg/L		200.7	03/19/15:203223	200.7	03/19/15:204278
Magnesium	18	1	mg/L		200.7	03/19/15:203223	200.7	03/19/15:204278
Potassium	4	1	mg/L		200.7	03/19/15:203223	200.7	03/19/15:204278
Sodium	130	1	mg/L		200.7	03/19/15:203223	200.7	03/19/15:204278
Total Cations	12.3	--	meq/L		200.7	03/19/15:203223	200.7	03/19/15:204278
Boron	0.2	0.1	mg/L		200.7	03/19/15:203223	200.7	03/19/15:204278
Copper	ND	10	ug/L		200.7	03/19/15:203223	200.7	03/19/15:204278
Iron	40	30	ug/L		200.7	03/19/15:203223	200.7	03/19/15:204278
Manganese	880	10	ug/L		200.7	03/19/15:203223	200.7	03/19/15:204278
Zinc	ND	20	ug/L		200.7	03/19/15:203223	200.7	03/19/15:204278
Gypsum Requirement	0.4	--	Tons/AF		200.7	03/19/15:203223	200.7	03/19/15:204278
SAR	3.1	--	--		200.7	03/19/15:203223	200.7	03/19/15:204278
Total Alkalinity	230	10	mg/L		2320B	03/18/15:203166	2320B	03/18/15:204307
Hydroxide	ND	10	mg/L		2320B	03/18/15:203166	2320B	03/18/15:204307
Carbonate	ND	10	mg/L		2320B	03/18/15:203166	2320B	03/18/15:204307
Bicarbonate	280	10	mg/L		2320B	03/18/15:203166	2320B	03/18/15:204307
Sulfate	110	2	mg/L		300.0	03/18/15:203225	300.0	03/18/15:204247
Chloride	229	5*	mg/L		300.0	03/18/15:203225	300.0	03/18/15:204247
Nitrate	ND	0.5	mg/L		300.0	03/18/15:203225	300.0	03/18/15:204247
Nitrate Nitrogen	ND	0.1	mg/L		300.0	03/18/15:203225	300.0	03/18/15:204247
Fluoride	ND	0.1	mg/L		300.0	03/18/15:203225	300.0	03/18/15:204247
Total Anions	13.3	--	meq/L		2320B	03/18/15:203166	2320B	03/18/15:204307
pH	7.2	--	units		4500-H B	03/19/15:203242	4500HB	03/19/15:204225
E. C.	1400	1	umhos/cm		2510B	03/19/15:203224	2510B	03/19/15:204206
TDS by Summation	872	--	mg/L		200.7	03/19/15:203223	200.7	03/19/15:204278
Wet Chemistry P:1								
Solids, Total Dissolved (TDS)	800	20	mg/L		2540CE	03/18/15:203197	2540C	03/19/15:204208

ND=Non-Detected. PQL=Practical Quantitation Limit. Containers: (AVT) Amber VOA TFE-Cap, (P) Plastic Preservatives: H2SO4 pH < 2 ‡Surrogate. * PQL adjusted for dilution.

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March 20, 2015

Lab ID : VI 1540850-002
Customer ID : 4-17878

Kenneth D. Schmidt & Assoc.
3701 Pegasus Dr., Suite #112
Bakersfield, CA 93308

Sampled On : March 17, 2015-08:35
Sampled By : Jim Angell
Received On : March 18, 2015-11:45
Matrix : Ag Water

Description : C-1 D
Project : Race Track Hill

Sample Result - Organic

Constituent	Result	PQL	Units	Note	Sample Preparation		Sample Analysis	
					Method	Date/ID	Method	Date/ID
TOCAVT:14								
TOC	0.9	0.5	mg/L		5310C	03/18/15:203198	5310C	03/18/15:204236

ND=Non-Detected. PQL=Practical Quantitation Limit. Containers: (AVT) Amber VOA TFE-Cap, (P) Plastic Preservatives: H2SO4 pH < 2 ‡Surrogate. * PQL adjusted for dilution.

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EPA 8015B TPH Diesel Water

Kenneth D. Schmidt & Assoc.
3701 Pegasus Dr., Ste 112
Bakersfield, CA 93308

APPL Inc.
908 North Temperance Avenue
Clovis, CA 93611

Attn: James Angell
Project: Racetrack Hill

ARF: 75860

Sample ID: RTH-7D

APPL ID: AZ12740

Sample Collection Date: 3/16/2015

QCG: #TPHD-150319A-195115

Method	Analyte	Result	PQL	Units	Extraction Date	Analysis Date
EPA 8015B-	DIESEL FUEL	Not detected	50.0	ug/L	3/19/2015	3/23/2015
EPA 8015B-	SURROGATE: OCTACOSANE (S)	94.5	28-142	%	3/19/2015	3/23/2015
EPA 8015B-	SURROGATE: ORTHO-TERPHENYL (S)	66.7	49-128	%	3/19/2015	3/23/2015

Quant Method:	TPHD121.M
Run #:	323011
Instrument:	Apollo
Sequence:	150323
Dilution Factor:	1
Initials:	LA

Printed: 3/24/2015 8:57:10 AM
Form 1 - APPL Standard GC - No MC

EPA 8015B TPH Diesel Water

Kenneth D. Schmidt & Assoc.
3701 Pegasus Dr., Ste 112
Bakersfield, CA 93308

APPL Inc.
908 North Temperance Avenue
Clovis, CA 93611

Attn: James Angell

Project: RACETRACK HILL

Sample ID: RTH-8D

Sample Collection Date: 3/11/2015

ARF: 75797

APPL ID: AZ12300

QCG: #TPHD-150312A-194885

Method	Analyte	Result	PQL	Units	Extraction Date	Analysis Date
EPA 8015B-	DIESEL FUEL	280 T3M	50.0	ug/L	3/12/2015	3/12/2015
EPA 8015B-	SURROGATE: OCTACOSANE (S)	93.9	28-142	%	3/12/2015	3/12/2015
EPA 8015B-	SURROGATE: ORTHO-TERPHENYL (S)	81.3	49-128	%	3/12/2015	3/12/2015

++(T3M) The analyst has noted that the chromatogram of this sample is mainly higher boiling hydrocarbons.

Quant Method:	TPHD121.M
Run #:	311053
Instrument:	Apollo
Sequence:	150311
Dilution Factor:	1
Initials:	LA

Printed: 3/18/2015 8:37:31 AM
Form 1 - APPL Standard GC - No MC

EPA 8015B TPH Diesel Water

Kenneth D. Schmidt & Assoc.
3701 Pegasus Dr., Ste 112
Bakersfield, CA 93308

APPL Inc.
908 North Temperance Avenue
Clovis, CA 93611

Attn: James Angell
Project: Racetrack Hill
Sample ID: RTH-9D
Sample Collection Date: 3/17/2015

ARF: 75860
APPL ID: AZ12742
QCG: #TPHD-150319A-195115

Method	Analyte	Result	PQL	Units	Extraction Date	Analysis Date
EPA 8015B-	DIESEL FUEL	Not detected	50.0	ug/L	3/19/2015	3/23/2015
EPA 8015B-	SURROGATE: OCTACOSANE (S)	94.9	28-142	%	3/19/2015	3/23/2015
EPA 8015B-	SURROGATE: ORTHO-TERPHENYL (S)	69.3	49-128	%	3/19/2015	3/23/2015

Quant Method: TPHD121.M
Run #: 323013
Instrument: Apollo
Sequence: 150323
Dilution Factor: 1
Initials: LA

Printed: 3/24/2015 8:57:11 AM
Form 1 - APPL Standard GC - No MC

EPA 8015B TPH Diesel Water

Kenneth D. Schmidt & Assoc.
3701 Pegasus Dr., Ste 112
Bakersfield, CA 93308

APPL Inc.
908 North Temperance Avenue
Clovis, CA 93611

Attn: James Angell
Project: Racetrack Hill
Sample ID: C-1 D
Sample Collection Date: 3/17/2015

ARF: 75860
APPL ID: AZ12741
QCG: #TPHD-150319A-195115

Method	Analyte	Result	PQL	Units	Extraction Date	Analysis Date
EPA 8015B-	DIESEL FUEL	Not detected	50.0	ug/L	3/19/2015	3/23/2015
EPA 8015B-	SURROGATE: OCTACOSANE (S)	95.1	28-142	%	3/19/2015	3/23/2015
EPA 8015B-	SURROGATE: ORTHO-TERPHENYL (S)	69.8	49-128	%	3/19/2015	3/23/2015

Quant Method:	TPHD121.M
Run #:	323012
Instrument:	Apollo
Sequence:	150323
Dilution Factor:	1
Initials:	LA

Printed: 3/24/2015 8:57:11 AM
Form 1 - APPL Standard GC - No MC

David L. Dettman
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Tucson, Arizona 85721-0077, USA

Kenneth D. Schmidt and Associates
Attn: Jim Angell
3701 Pegasus Drive, Suite 112
Bakersfield CA 93308

March 17, 2015

REPORT OF ANALYSES **1 water samples for δ18O and δD**

W number	Sample	δ18O ‰	δD ‰
61739	RTH 8D	-7.4	-60
Analytical Precision		0.08	0.9

David Dettman
Research Scientist

David L. Dettman.
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Kenneth D. Schmidt and Associates
Attn: Jim Angell
3701 Pegasus Drive, Suite 112
Bakersfield CA 93308

March 20, 2015

REPORT OF ANALYSES **3 water samples for δ18O and δD**

W number	Sample	δ18O ‰	δD ‰
61762	RTH-7D	-6.2	-60
61763	C-1	-8.4	-68
61764	RTH-9D	-7.4	-65
Analytical Precision		0.08	0.9

David Dettman
Research Scientist

Appendix D

Laboratory Reports

Appendix D1

Produced Water Quality Lab Reports

Lab Sheet 1

J. J. EGLIN

D. A. GRIESEL

BC LABORATORIES

OIL - CORES - SOIL - WATER

3016 UNION AVE. + FAIRVIEW 3-0077
BAKERSFIELD, CALIFORNIA

Submitted By: Giumarra Vineyards Corp.
P.O. Box 1653
Bakersfield, California

Date Reported: 1/21/60
Date Received: 1/20/60
Laboratory No: 40543

Marked: "Seepage Pits at Santa Margarita Outcrop" - Sec. 24, T. 29 S., R. 29 E.

IRRIGATION WATER ANALYSIS

Key to Qualitative Classification

		$K \times 10^5$ @ 25°C	Boron (B) ppm	Sodium Percent	Chloride epm
Class I Excellent to Good	Less Than:	100	0.5	50	5
Class II Good to Injurious		100-300	0.5-2.0	50-70	5-10
Class III Injurious to Unsatisfactory	More Than:	300	2.0	70	10

Sample Description

Boron, ppm	17.1	III	
Sodium Percentage			
Chloride, epm	55.79	III	(1975 ppm)
$K \times 10^5$ at 25°C (Salinity)	655	III	
Gypsum Application for treating "Residual Sodium Carbonate"			
Lbs. 100% Gyp./Hr *			

*100 Gallons per min. flow rate

EC 6,550 µmhos/cm
Cl 1,975 mg/L
B 17.1 mg/L

Constituents, P. P. M.

Calcium, (Ca)	
Magnesium, (Mg)	
Sodium, (Na)	1200
Potassium, (K)	
Carbonates, (CO_3)	
Bicarbonates, (HCO_3)	
Chlorides, (CL)	1975
Sulphates (SO_4)	
Nitrate, (NO_3)	
Fluoride, (F)	
Total Iron, (Fe)	
Total Hardness as $CaCO_3$	
Total Dissolved Solids, 105°C	3700
Total Dissolved Solids Red Heat	
pH or Hydrogen-ion activity	

B C LABORATORIES

By [illegible signature]

TEL. FAIRVIEW 7-8567

Lab Sheet 2

P. O. BOX 867

HORNKOHL LABORATORIES, INC.

CHEMICAL AND TESTING ENGINEERS

714 TRUXTUN AVENUE

BAKERSFIELD, CALIFORNIA

January 16, 1961

Laboratory No. 126,669

Marked Filtered Water XX
1-3-61

Sample Water

Received January 3, 1961

Submitted by Valley Waste Disposal Company
3624 Pierce Road
Bakersfield, California * * * * * * * * * *

STATE WATER ANALYSIS

Constituents	Parts Per Million	Grains Per Gallon
Carbonates	0.0	0.00
Bicarbonates	123.2	7.20
Chlorides	1631.2	95.39
Sulphates	96.0	5.61
Sulphides	0.0	0.00
Calcium	476.0	27.84
Magnesium	73.2	4.28
Sodium	465.1	27.20
Potassium	19.6	1.15
Boron	2.0	0.12
Fluorides	0.8	0.05
pH	7.7	
Conductivity - Mhos/cm^3 x 10^6 @ 25° C.	4,906	
Total Solids @ 105°C.	2,826	165.26

Respectfully submitted,

HORNKOHL LABORATORIES, INC.

Frederick Fischer

Frederick Fischer, Chief Chemist

FF:dh

TEL. 327-8567

Lab Sheet 3

P. O. BOX 867

HORNKOHL LABORATORIES, Inc.

CHEMICAL AND TESTING ENGINEERS
714 TRUXTUN AVENUE
BAKERSFIELD, CALIFORNIA

January 22, 1963

Laboratory No. 141,119

Marked Race Track A Sec. Sump #4

Sample Water

Received January 18, 1963

Submitted by Valley Waste Disposal Company
3624 Pierce Road
Bakersfield, California

****

PARTIAL WATER ANALYSIS

CONSTITUENTS	PARTS PER MILLION	GRAINS PER GALLON
CHLORIDES	2709.1	158.43
BORON	17.0	0.99
TOTAL DISSOLVED SOLIDS	5094.8	297.94

Respectfully submitted,
HORNKOHL LABORATORIES, INC.

Frederick Fischer

Frederick Fischer, Chief Chemist

FF:es

TEL. FAirview 7-8567

Lab Sheet 4

P.O. BOX 867

HORNKOHL LABORATORIES, Inc.

CHEMICAL AND TESTING ENGINEERS
714 TRUXTUN AVENUE
BAKERSFIELD, CALIFORNIA

December 23, 1964

Laboratory No. 159,375

Marked Racetrack Filtered Water

Sample Water

Received December 18, 1964

Submitted by Valley Waste Disposal Company
3624 Pierce Road
Bakersfield, California

****

Consituents	Parts per Million	Grains per Gallon
Boron	11.03	0.65
Chlorides	2553.0	149.30
Total Dissolved Solids	4399.0	257.25

Respectfully submitted,

HORNKOHL LABORATORIES, INC.,

Gerald E. Foreman

FOR -- Technical Director

cg

EPHONE (805) 327-8567

Lab Sheet 5

OILWELL RESEARCH, INC.
HORNKOHL LABORATORIES DIVISION

CHEMICAL AND TESTING ENGINEERS
714 TRUXTUN AVENUE
BAKERSFIELD, CALIFORNIA 93302

November 2, 1979

Laboratory No 2A-785-2 **Marked** Race Track C

Sample Water

Received October 23, 1979

Submitted by VALLEY WASTE DISPOSAL COMPANY
1804 Oak Street
Bakersfield, CA 93301
Attention: Mr. Dick Burdick

* * * * *

SPECIAL STATE WATER ANALYSIS-OILFIELD

Constituents	Milligrams/Liter
Carbonates, CO_3	0
Bicarbonates, HCO_3	153
Chlorides, Cl	2410
Sulfates, SO_4	<5
Sulfides, S	4.6
Nitrates, NO_3	58
Calcium, Ca	201
Magnesium, Mg	10
Sodium, Na	1395
Potassium, K	4.9
Boron, B	6
Fluorides, F	5.1
Hardness as $CaCO_3$	544
Total Dissolved Solids	4250
Oil & Grease	35

pH Value	7.6
Conductivity:	
Micromhos/cm @ 25°C.	6050
Resistivity:	
Ohm Meters @ 25°C.	165

Respectfully submitted,

Victor P. Hoff

m

Lab Sheet 6

AGRICULTURE
CHEMICAL ANALYSIS
PETROLEUM

BC LABORATORIES, INC.

4100 PIERCE ROAD, 93308 BAKERSFIELD, CALIFORNIA 93308 PHONE 327-4911

Valley Waste Disposal Company
1400 Easton Drive, Suite 139B
Bakersfield, California 93309

Date Reported: 10/19/84
Date Received: 9/28/84
Laboratory No.: 12364

Marked: V.W.D. East Side Race Track

Irrigation WATER ANALYSIS

Salinity, EC x 10^3 (Mmhos/cm) @ 25° C

Below 0.5	Very low salt content, may cause permeability problems.
Below 0.75	Low salinity hazard - sat. for most crops.
0.75 - 1.5	Medium salinity hazard - sat. for moderately salt tolerant crops.
1.5 - 3.0	High salinity hazard - sat. for highly salt tolerant crops.
Over 3.0	Very high salinity hazard - generally unsuitable for continual use except under favorable conditions of soil, climate, tolerance of crop and necessary leaching.

NOTE: This interpretation of EC assumes that 10-20% of the total water applied passes through and below the root zone. In most cases deep percolation losses will satisfy this leaching requirement for the usual crops of the area.

Salinity
EC Mmhos/cm = 5.60

Boron, ppm

Below 0.5	Satisfactory for all crops.
0.5 - 1.0	Satisfactory for most crops; sensitive crops may show injury - leaf injury, but yields may not be affected.
1.0 - 2.0	Satisfactory for semi-tolerant crops. Sensitive crops usually reduced in yield and vigor.
2.0 - 4.0	Only tolerant crops produce satisfactory yields.

Boron, (B) = 20. **ppm**

Chloride, expressed as epm. Fruit crops in general and many wood ornamentals are chloride sensitive.

Below 2	Satisfactory for all crops.
2 - 10	Range associated with leaf burn on chloride sensitive crops.
Above 10	Generally unsatisfactory for chloride sensitive crops.
CAUTION:	Under high rates of evaporation water with 3 epm chloride has caused leaf burn on sensitive tree crops.

CHLORIDE (Cl) = 52.4 **epm.**

SAR Sodium Adsorption Ratio. A calculated value used to estimate the exchangeable sodium percentage (ESP) of a soil after long term use of the water.

SAR (Water)	ESP (Soil)	
Below 6	Below 10	No soil permeability problem due to sodium.
6 - 9	10 - 15	Possible permeability problems with fine textured soils (saturation percentage above 50).
Above 9	Above 15	Permeability problems likely on all mineral soils with possible exception of very coarse textured soils (saturation percentage below 20).

NOTE: Permeability problems are more probable at a given SAR with waters of low salinity than at high salinity.

***SAR of Water =** 54.61
ESP of Soil = 27.76

pHc** = 7.37

Gypsum Requirement = none **Lbs. 100% Gyp./Hr./100 Gal./min.**
(for treating "Residual Sodium Carbonate")

Constituents PPM (parts per million)

Calcium, (Ca)	125.	Nitrate, (NO_3)	(-) 0.4	Carbonates, (CO_3)	0.
Magnesium, (Mg)	8.	Nitrate, (N)	(-) 0.1	Bicarbonates, (HCO_3)	230.
Sodium, (Na)	1150.			Chlorides, (Cl)	1855.
		pH	7.7	Sulphates, (SO_4)	(-) 5.
Total Hardness as $CaCO_3$	346.				
	20.2 gr/gal			Total Dissolved Solids	3399.

* Adjusted SAR. (-) refers to "less than".
** Values of pHc above 8.4 indicate tendency to dissolve lime from soil through which the water moves; values below 8.4 indicate tendency to precipitate lime from waters applied

B C LABORATORIES

By J. J. Eglin

Lab Sheet 7

BC LABORATORIES

VALLEY WASTE DISPOSAL CO
1400 EASTON DR
SUITE 139B
BAKERSFIELD, CA 93309
Attn.: Larry Miller 322-5004

Date Reported: 05/04/92
Date Received: 04/22/92
Laboratory No.: 3607-1

Sample Description: RACETRACK - A, SAMPLED 4-22-92

WATER ANALYSIS
(GENERAL CHEMISTRY)

Constituents	Results	Units	D.L.R.	Method
Calcium	188.	mg/L	0.1	SW-7140
Magnesium	9.0	mg/L	0.01	SW-7450
Sodium	1290.	mg/L	0.1	SW-7770
Potassium	16.5	mg/L	0.1	SW-7610
Total Cations	66.7	meq/L	0.01	Calculated
Hydroxide	None Detected	mg/L	0.8	SM-403
Carbonate	None Detected	mg/L	2.6	SM-403
Bicarbonate	465.	mg/L	2.6	SM-403
Chloride	2010.	mg/L	1.8	EPA-300.0
Sulfate	None Detected	mg/L	5.	EPA-300.0
Nitrate as NO3	None Detected	mg/L	0.4	EPA-300.0
Nitrate as N	None Detected	mg/L	0.1	EPA-300.0
Total Anions	64.3	meq/L	0.01	Calculated
pH	7.6	pH Units	0.1	SW-9040
Electrical Conductivity @ 25 C	7100.	umhos/cm	1.	SW-9050
Total Dissolved Solids by summation	3750.	mg/l	10.	Calculated
Hardness as CaCO3	506.	mg/L	0.3	Calculated
SAR	24.9	-	0.01	Calculated
Adjusted SAR	61.6	-	0.01	Calculated
ESP	26.2	-	0.01	Calculated
pHc	6.93	-	0.01	Calculated
Gypsum Requirement # 100% Gyp/Hr/100 Gal/Min	NONE	#100% gyp./	0.01	Calculated

D.L.R. = Detection Limit for Reporting purposes.

REFERENCES:
EPA = "Methods for Chemical Analysis of Water and Wastes", EPA-600, 14-79-020.
SM = "Standard Methods for Examination of Water and Wastewater", 16th Edition 1986.
SW = "Test Methods for Evaluating Solid Wastes Physical/Chemical Methods", SW 846, September, 1986.

M. Atencio
Department Supervisor

Lab Sheet 8

ZALCO LABORATORIES, INC.

Analytical & Consulting Services

Valley Waste Disposal
1400 Easton Drive, #139B
Bakersfield, CA 93309

Laboratory No: 36035
Date Received: 5-28-93
Date Reported: 6-8-93

Attention: Larry Bright

Sample: Water

Sample Description: Produced Water, Valley Waste Edison Field Section 34, Incoming Water Monitoring Program #92-110
Sampled by Larry Miller on 5-28-93 at 1600 hours

Method/ Reference	Constituent	Results	MRL
407A/2	Chloride, Cl, mg/l	2250	5.0
200.7/1	Boron, B, mg/l	16	0.1
120.1/1	Specific Conductance, μmhos/cm at 25 °C	7400	10

MRL = Minimum Reporting Level

References:
1. EPA 600/4-79-020, March 1983.
2. APHA Standard Methods, 16th Edition, 1985.

Jim Etherton
Lab Operations Manager

JE/ccw

4309 Armour Avenue Bakersfield, California 93308
(805) 395-0539 FAX (805) 395-3069

Lab Sheet 9

ZALCO LABORATORIES, INC.
Analytical & Consulting Services

Valley Waste Disposal
1400 Easton Drive, #139-B
Bakersfield, CA 93309

Laboratory No: 36408-2
Date Received: 7-2-93
Date Reported: 7-15-93

Attention: Larry Bright

Sample Identification: Rt,A Incoming Water
Sampled by Larry Miller on 7-1-93

IRRIGATION WATER ANALYSIS

pH	8.0
Specific Conductance, (micromhos/cm @ 25 C)	6190

Constituents	mg/l	meq/l
Calcium, Ca	160	7.98
Magnesium, Mg	8.4	0.69
Sodium, Na (calculated)	1180	51.27
Potassium, K	14	0.36
Alkalinity as:		
Hydroxide, OH	0	0
Carbonate, CO3	0	0
Bicarbonate, HCO3	530	8.66
Chloride, Cl	1830	51.53
Sulfate, SO4	5.3	0.11
Nitrate, NO3	< 1.0	0
Totals (Sum)	3450	120.61
Boron, B	14	
Total Dissolved Solids, (Grav)	3570	
Calculated Hardness, CaCO3	430	
Sodium Adsorption Ratio, SAR	24.6	
Exchangeable Sodium Percentage, ESP	25.9	
Cation/Anion Balance, %	-1.47	
Sodium, Na (determined), mg/l	1100	
Langelier Scale Index	1.11	

Jim Etherton
Laboratory Director

4309 Armour Avenue Bakersfield, California 93308
(805) 395-0539 FAX (805) 395-3069

Lab Sheet 10

ZALCO LABORATORIES, INC.
Analytical & Consulting Services

4309 Armour Avenue
Bakersfield, California 93308

(805) 395-0539
FAX (805) 395-3069

Valley Waste Disposal
1400 Easton Drive, Suite 139B
Bakersdield, CA 93389

Laboratory No: 60008-3
Date Received: 10-2-95
Date Reported: 10-10-95

Attention: Larry Bright

Sample Identification: Racetrack A Section
Sampled by Larry Bright on 10-2-95

IRRIGATION WATER ANALYSIS

pH	8.2
Electrical Conductivity, EC (millimhos/cm @ 25 C)	6.87

Constituents	mg/l	meq/l
Calcium, Ca	170	8.48
Magnesium, Mg	13	1.07
Sodium, Na (calculated)	1300	55.77
Potassium, K	16	0.41
Alkalinity as:		
Hydroxide, OH	0	0
Carbonate, CO3	0	0
Bicarbonate, HCO3	480	7.94
Chloride, Cl	2000	57.79
Sulfate, SO4	< 5.0	0
Nitrate, NO3	< 1.0	0
Totals (Sum)	3800	131.46
Boron, B	13	
Total Dissolved Solids, (Grav)	3900	
Calculated Hardness, CaCO3	480	
Sodium Adsorption Ratio, SAR	25.5	
Exchangeable Sodium Percentage, ESP	26.7	
Cation/Anion Balance, %	0.29	
Sodium, Na (determined), mg/l	1300	
Langelier Scale Index	1.70	
Gypsum Requirement, lbs/ac-ft	0	

Jim Etherton
Laboratory Director

ZALCO LABORATORIES, INC.
Analytical & Consulting Services

4309 Armour Avenue
Bakersfield, California 93308

(805) 395-0539
FAX (805) 395-3069

Lab Sheet 11

Valley Waste Disposal
1400 Easton Drive, Suite 139B
Bakersfield, CA 93309

Laboratory No: 69325-1
Date Received: 7-14-97
Date Reported: 7-22-97

Attention: Larry Miller

Sample Identification: R.T.A.
Sampled by Client on 7-13-97 at 1000 hours

IRRIGATION WATER ANALYSIS

pH 7.9
Electrical Conductivity, EC
(millimhos/cm @ 25 C) 6.64

Constituents	mg/l	meq/l
Calcium, Ca	180	8.98
Magnesium, Mg	11	0.91
Sodium, Na (calculated)	1200	53.29
Potassium, K	14	0.36
Alkalinity as:		
Hydroxide, OH	0	0
Carbonate, CO3	0	0
Bicarbonate, HCO3	430	7.02
Chloride, Cl	2000	56.38
Sulfate, SO4	6	0.13
Nitrate, NO3	< 1.0	0
Totals (Sum)	3600	127.07
Boron, B	15	
Total Dissolved Solids, (Grav)	3800	
Calculated Hardness, CaCO3	490	
Sodium Adsorption Ratio, SAR	24	
Exchangeable Sodium Percentage, ESP	25.5	
Cation/Anion Balance, %	1.24	
Sodium, Na (determined), mg/l	1300	
Langelier Scale Index	1.37	
Gypsum Requirement, lbs/ac-ft	0	

Jim Etherton
Laboratory Director

Lab Sheet 12

ZALCO LABORATORIES, INC.
Analytical & Consulting Services

4309 Armour Avenue
Bakersfield, California 93308

(661) 395-0539
FAX (661) 395-3069

Valley Water Management Company	Project: Master	Work Order No.:	**1307211**
7500 Meany Avenue	Project #:	Reported:	07/23/2013
Bakersfield, CA 93308	Attention: Russell Emerson	Received:	07/18/2013 12:30

Lab Sample ID:	**1307211-01**	Collected By:	
Client Sample ID:	Produced Water RTC-Plant	Date Collected:	7/18/2013 10:25:00AM

Analyte	Results	PQL		Units	Flag	Method	Date Prepared	Date Analyzed	Init.
General Chemistry			*MCL Limits*						
Electrical Conductivity	5.7	0.010		mmhos/cm		SM 2510B	7/18/13	7/23/13	MSS
Chloride	1800	200		mg/L		EPA 300.0	7/22/13	7/22/13	LME
Metals									
Boron	14	0.10		mg/L		EPA 200.7	7/23/13	7/23/13	SS

NSS: Non Sufficient Sample H: Exceeds Analysis Hold Time TTLC: Total Threshold Limit Concentration STLC Soluble Threshold Limit Concentration TCLP: Toxicity Characteristic Leaching Procedure MCL Maximum Contaminant Level *: See Case Narrative
The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

Note: Samples analyzed for regulatory purposes should be put on ice immediately after sampling and received by the laboratory at temperatures between 0-6°C. Microbiological analysis requires samples to be at least 4-10°C when received at the laboratory. For additional information regarding the limitations of the method(s) referred to, please call us at 661-395-0539.

Lab Sheet 13

ZALCO LABORATORIES, INC.
Analytical & Consulting Services

4309 Armour Avenue
Bakersfield, California 93308

(661) 395-0539
FAX (661) 395-3069

Valley Water Management Company	Project: Master	Work Order No.: **1410322**
7500 Meany Avenue	Project #:	Reported: 11/07/2014
Bakersfield, CA 93308	Attention: Russell Emerson	Received: 10/24/2014 10:50

Lab Sample ID: **1410322-01**	Collected By: Russell Emerson
Client Sample ID: RTC Discharge Water	Date Collected: 10/24/2014 12:00:00AM

Analyte	Results	PQL		Units	Flag	Method	Date Prepared	Date Analyzed	Init.
Alkalinity									
Total Alkalinity	290	10		mg/L		SM 2320B	10/24/14	10/24/14	SAM
Bicarbonate (HCO3)	290	10		mg/L		SM 2320B	10/24/14	10/24/14	SAM
Carbonate (CO3)	<10	10		mg/L		SM 2320B	10/24/14	10/24/14	SAM
Hydroxide (OH)	<10	10		mg/L		SM 2320B	10/24/14	10/24/14	SAM
General Chemistry			*MCL Limits*						
Electrical Conductivity	5.7	0.010		mmhos/cm		SM 2510B	10/24/14	10/24/14	MSS
Chloride	1500	100		mg/L		EPA 300.0	10/24/14	10/24/14	MSS
MBAS (calculated as LAS, mol wt__.)	<0.050	0.050	*0.5*	mg/L		SM 5540C	10/27/14	10/27/14	HG
pH	7.49			pH Units		EPA 150.1	10/24/14	10/24/14	SAM
Specific Conductance	5700	10		umhos/cm		SM 2510B	10/24/14	10/24/14	MSS
Sulfate as SO4	18	0.50		mg/L		EPA 300.0	10/24/14	10/24/14	MSS
Total Dissolved Solids	3000	10		mg/L		SM 2540C	10/27/14	10/27/14	MSS
Hardness									
Hardness (as CaCO3)	290	2.0		mg/L		SM 2340B	10/27/14	10/27/14	SS
Inorganic Chemical			*MCL Limits*						
Copper	<50	50	*1000*	ug/L		EPA 200.7	10/27/14	10/27/14	SS
Iron	130	100	*300*	ug/L		EPA 200.7	10/27/14	10/27/14	SS
Manganese	97	20	*50*	ug/L		EPA 200.7	10/27/14	10/27/14	SS
Silver	<10	10	*100*	ug/L		EPA 200.7	10/27/14	10/27/14	SS
Zinc	<50	50	*5000*	ug/L		EPA 200.7	10/27/14	10/27/14	SS
Metals									
Boron	13	0.10		mg/L		EPA 200.7	10/27/14	10/27/14	SS
Calcium	100	0.050		mg/L		EPA 200.7	10/27/14	10/27/14	SS
Magnesium	10	0.050		mg/L		EPA 200.7	10/27/14	10/27/14	SS
Potassium	12	0.50		mg/L		EPA 200.7	10/27/14	10/27/14	SS
Sodium	1300	7.0		mg/L		EPA 200.7	10/27/14	10/27/14	SS

NSS: Non Sufficient Sample H: Exceeds Analysis Hold Time TTLC: Total Threshold Limit Concentration STLC: Soluble Threshold Limit Concentration TCLP: Toxicity Characteristic Leaching Procedure MCL: Maximum Contaminant Level *: See Case Narrative

Note: Samples analyzed for regulatory purposes should be put on ice immediately after sampling and received by the laboratory at temperatures between 0-6°C. Microbiological analysis requires samples to be at least 4-10°C when received at the laboratory. For additional information regarding the limitations of the method(s) referred to, please call us at 661-395-0539.

Lab Sheet 14

ZALCO LABORATORIES, INC.
Analytical & Consulting Services

4309 Armour Avenue
Bakersfield, California 93308

(661) 395-0539
FAX (661) 395-3069

Valley Water Management Company 7500 Meany Avenue Bakersfield, CA 93308	Project: Master Project #: Attention: Russell Emerson	Work Order No.: **1501060** Reported: 01/14/2015 Received: 01/07/2015 10:30

Lab Sample ID: **1501060-01**	Collected By: Russell Emerson
Client Sample ID: Pond Effluent	Date Collected: 1/6/2015 10:00:00AM

Analyte	Results	PQL		Units	Flag	Method	Date Prepared	Date Analyzed	Init.
Alkalinity									
Total Alkalinity	280	10		mg/L		SM 2320B	1/7/15	1/7/15	SAM
Bicarbonate (HCO3)	280	10		mg/L		SM 2320B	1/7/15	1/7/15	SAM
Carbonate (CO3)	<10	10		mg/L		SM 2320B	1/7/15	1/7/15	SAM
Hydroxide (OH)	<10	10		mg/L		SM 2320B	1/7/15	1/7/15	SAM
General Chemistry			*MCL Limits*						
Hexavalent Chromium	<5.0	5.0		ug/L	I-02	E218.6	1/12/15	1/12/15	SAM
Nitrate as NO3	<2.00	2.00	*45*	mg/L		EPA 300.0	1/8/15	1/8/15	MSS
Electrical Conductivity	5.6	0.010		mmhos/cm		SM 2510B	1/7/15	1/7/15	SAM
Bromide	<0.10	0.10		mg/L		EPA 300.0	1/8/15	1/12/15	MSS
Chloride	1700	200		mg/L		EPA 300.0	1/8/15	1/8/15	MSS
pH	7.33			pH Units		EPA 150.1	1/7/15	1/7/15	SAM
Sulfate as SO4	<0.50	0.50		mg/L		EPA 300.0	1/8/15	1/12/15	MSS
Total Dissolved Solids	3100	10		mg/L		SM 2540C	1/7/15	1/7/15	MSS
Hardness									
Hardness (as CaCO3)	290	2.0		mg/L		SM 2340B	1/12/15	1/12/15	SS
Metals									
Boron	14	0.10		mg/L		EPA 200.7	1/12/15	1/12/15	SS
Chromium	<0.050	0.050		mg/L		EPA 200.7	1/12/15	1/12/15	SS
Arsenic	0.086	0.020		mg/L		EPA 200.7	1/12/15	1/12/15	SS
Calcium	100	0.050		mg/L		EPA 200.7	1/12/15	1/12/15	SS
Iron	0.28	0.10		mg/L		EPA 200.7	1/12/15	1/12/15	SS
Magnesium	9.6	0.050		mg/L		EPA 200.7	1/12/15	1/12/15	SS
Manganese	0.092	0.030		mg/L		EPA 200.7	1/12/15	1/12/15	SS
Sodium	1600	7.0		mg/L		EPA 200.7	1/12/15	1/12/15	SS
Oil & Grease Testing									
Oil & Grease	13.0	5.00		mg/L		EPA 1664	1/8/15	1/8/15	JMM
Radiological Testing									
Uranium (pCi/L)	<0.67	0.67		pCi/L		EPA 200.8	1/12/15	1/13/15	MSS
Uranium (ug/L)	<1.0	1.0		ug/L		EPA 200.8	1/12/15	1/13/15	MSS

NSS: Non Sufficient Sample H: Exceeds Analysis Hold Time TTLC: Total Threshold Limit Concentration STLC: Soluble Threshold Limit Concentration TCLP: Toxicity Characteristic Leaching Procedure MCL: Maximum Contaminant Level *: See Case Narrative

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

Note: Samples analyzed for regulatory purposes should be put on ice immediately after sampling and received by the laboratory at temperatures between 0-6°C. Microbiological analysis requires samples to be at least 4-10°C when received at the laboratory. For additional information regarding the limitations of the method(s) referred to, please call us at 661-395-0539.

Lab Sheet 15A

May 21, 2015

Kenneth D. Schmidt & Assoc.
3701 Pegasus Dr., Suite #112
Bakersfield, CA 93308

Lab ID : VI 1541268-002
Customer ID : 4-17878

Sampled On : April 20, 2015-15:10
Sampled By : James Angell
Received On : April 22, 2015-11:30
Matrix : Drinking Water

Description : Racetrack Hill Influent
Project : Race Track Hill

Sample Result - Inorganic

Constituent	Result	PQL	Units	MCL/AL	Sample Preparation Method	Sample Preparation Date/ID	Sample Analysis Method	Sample Analysis Date/ID
Irrigation Suit[P:1]								
Total Hardness as CaCO3	265	--	mg/L		200.7	04/25/15:204816	200.7	04/25/15:206184
Calcium	88	1	mg/L		200.7	04/25/15:204816	200.7	04/25/15:206184
Magnesium	11	1	mg/L		200.7	04/25/15:204816	200.7	04/25/15:206184
Potassium	17	1	mg/L		200.7	04/25/15:204816	200.7	04/25/15:206184
Sodium	923	5*	mg/L		200.7	04/25/15:204816	200.7	04/27/15:206270
Total Cations	45.9	--	meq/L		200.7	04/25/15:204816	200.7	04/25/15:206184
Boron	12.6	0.1	mg/L		200.7	04/25/15:204816	200.7	04/25/15:206184
Copper	ND	10	ug/L	1000[2]	200.7	04/25/15:204816	200.7	04/25/15:206184
Iron	370	30	ug/L	300[2]	200.7	04/25/15:204816	200.7	04/25/15:206184
Manganese	120	10	ug/L	50[2]	200.7	04/25/15:204816	200.7	04/25/15:206184
Zinc	30	20	ug/L		200.7	04/25/15:204816	200.7	04/25/15:206184
Gypsum Requirement	4.9	--	Tons/AF		200.7	04/25/15:204816	200.7	04/25/15:206184
SAR	24.7	--	--		200.7	04/25/15:204816	200.7	04/25/15:206184
Total Alkalinity	330	10	mg/L		2320B	04/27/15:204887	2320B	04/27/15:206268
Hydroxide	ND	10	mg/L		2320B	04/27/15:204887	2320B	04/27/15:206268
Carbonate	ND	10	mg/L		2320B	04/27/15:204887	2320B	04/27/15:206268
Bicarbonate	410	10	mg/L		2320B	04/27/15:204887	2320B	04/27/15:206268
Sulfate	3	2	mg/L	500[2]	300.0	04/22/15:204880	300.0	04/23/15:206326
Chloride	1370	20*	mg/L	500[2]	300.0	04/22/15:204880	300.0	04/23/15:206326
Nitrate	ND	0.4	mg/L	45	4500NO3F	04/29/15:204972	4500NO3F	04/29/15:206391
Nitrate Nitrogen	ND	0.1	mg/L	10	4500NO3F	04/29/15:204972	4500NO3F	04/29/15:206391
Fluoride	3.3	0.1	mg/L	2	300.0	04/22/15:204880	300.0	04/23/15:206326
Total Anions	45.6	--	meq/L		2320B	04/27/15:204887	2320B	04/27/15:206268
pH	7.4	--	units		4500-H B	04/23/15:204734	4500HB	04/23/15:206085
E. C.	4630	1	umhos/cm	1600[2]	2510B	04/23/15:204719	2510B	04/23/15:206051
TDS by Summation	2830	--	mg/L		200.7	04/25/15:204816	200.7	04/25/15:206184
Wet Chemistry[P:1]								
Solids, Total Dissolved (TDS)	2560	20	mg/L	1000[2]	2540CE	04/23/15:204727	2540C	04/24/15:206120

ND=Non-Detected. PQL=Practical Quantitation Limit. Containers: (P) Plastic Preservatives: N/A ‡Surrogate. * PQL adjusted for dilution.
MCL = Maximum Contamination Level. 2 - Secondary Standard. 3 - CDPH Notification Level. AL = Regulatory Action Level.

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Lab Sheet 15B

EPA 8015B TPH Diesel Water

Kenneth D. Schmidt & Assoc.
3701 Pegasus Dr., Ste 112
Bakersfield, CA 93308

APPL Inc.
908 North Temperance Avenue
Clovis, CA 93611

Attn: James Angell

Project: Racetrack Hill

ARF: 76199

Sample ID: Racetrack Hill Influent

APPL ID: AZ14953

Sample Collection Date: 4/20/2015

QCG: #TPHD-150423A-196288

Method	Analyte	Result	PQL	MDL	Units	Extraction Date	Analysis Date
EPA 8015B-	DIESEL FUEL	5000 ++	50.0	40.40	ug/L	04/23/15	04/24/15
EPA 8015B-	SURROGATE: OCTACOSANE (S)	156 #	28-142		%	04/23/15	04/24/15
EPA 8015B-	SURROGATE: ORTHO-TERPHENYL (	97.9	49-128		%	04/23/15	04/24/15

= Recovery (or RPD) is outside QC limits.
++(T6) The analyst has noted that the chromatogram of this sample is mainly a match to hydrocarbons within the range of diesel fuel.

Quant Method: TPHD121.M
Run #: 424019
Instrument: Apollo
Sequence: 150424
Dilution Factor: 1
Initials: LA

Printed: 5/7/2015 11:06:53 AM
APPL-F1-SC-NoMC-REG MDLs

Appendix D2

Off-Site Well Lab Reports

May 21, 2015

Kenneth D. Schmidt & Assoc.
3701 Pegasus Dr., Suite #112
Bakersfield, CA 93308

Lab ID : VI 1541268-001
Customer ID : 4-17878

Sampled On : April 20, 2015-14:06
Sampled By : James Angell
Received On : April 22, 2015-11:30
Matrix : Drinking Water

Description : Well 26B
Project : Race Track Hill

Sample Result - Inorganic

Constituent	Result	PQL	Units	MCL/AL	Sample Preparation Method	Sample Preparation Date/ID	Sample Analysis Method	Sample Analysis Date/ID
Irrigation SuitP:1								
Total Hardness as CaCO3	72.4	--	mg/L		200.7	04/25/15:204816	200.7	04/25/15:206184
Calcium	29	1	mg/L		200.7	04/25/15:204816	200.7	04/25/15:206184
Magnesium	ND	1	mg/L		200.7	04/25/15:204816	200.7	04/25/15:206184
Potassium	4	1	mg/L		200.7	04/25/15:204816	200.7	04/25/15:206184
Sodium	114	1	mg/L		200.7	04/25/15:204816	200.7	04/25/15:206184
Total Cations	6.5	--	meq/L		200.7	04/25/15:204816	200.7	04/25/15:206184
Boron	0.1	0.1	mg/L		200.7	04/25/15:204816	200.7	04/25/15:206184
Copper	ND	10	ug/L	1000[2]	200.7	04/25/15:204816	200.7	04/25/15:206184
Iron	ND	30	ug/L	300[2]	200.7	04/25/15:204816	200.7	04/25/15:206184
Manganese	20	10	ug/L	50[2]	200.7	04/25/15:204816	200.7	04/25/15:206184
Zinc	ND	20	ug/L		200.7	04/25/15:204816	200.7	04/25/15:206184
Gypsum Requirement	0.7	--	Tons/AF		200.7	04/25/15:204816	200.7	04/25/15:206184
SAR	5.8	--	--		200.7	04/25/15:204816	200.7	04/25/15:206184
Total Alkalinity	110	10	mg/L		2320B	04/23/15:204721	2320B	04/23/15:206104
Hydroxide	ND	10	mg/L		2320B	04/23/15:204721	2320B	04/23/15:206104
Carbonate	ND	10	mg/L		2320B	04/23/15:204721	2320B	04/23/15:206104
Bicarbonate	130	10	mg/L		2320B	04/23/15:204721	2320B	04/23/15:206104
Sulfate	191	2	mg/L	500[2]	300.0	04/22/15:204880	300.0	04/23/15:206326
Chloride	35	1	mg/L	500[2]	300.0	04/22/15:204880	300.0	04/23/15:206326
Nitrate	ND	0.5	mg/L	45	300.0	04/22/15:204880	300.0	04/23/15:206326
Nitrate Nitrogen	ND	0.1	mg/L	10	300.0	04/22/15:204880	300.0	04/23/15:206326
Fluoride	0.2	0.1	mg/L	2	300.0	04/22/15:204880	300.0	04/23/15:206326
Total Anions	7.1	--	meq/L		2320B	04/23/15:204721	2320B	04/23/15:206104
pH	7.7	--	units		4500-H B	04/23/15:204734	4500HB	04/23/15:206085
E. C.	750	1	umhos/cm	1600[2]	2510B	04/23/15:204719	2510B	04/23/15:206051
TDS by Summation	503	--	mg/L		200.7	04/25/15:204816	200.7	04/25/15:206184
Wet ChemistryP:1								
Solids, Total Dissolved (TDS)	490	20	mg/L	1000[2]	2540CE	04/23/15:204727	2540C	04/24/15:206120

ND=Non-Detected. PQL=Practical Quantitation Limit. Containers: (P) Plastic Preservatives: N/A ‡Surrogate. * PQL adjusted for dilution.
MCL = Maximum Contamination Level. 2 - Secondary Standard. 3 - CDPH Notification Level. AL = Regulatory Action Level.

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EPA 8015B TPH Diesel Water

Kenneth D. Schmidt & Assoc.
3701 Pegasus Dr., Ste 112
Bakersfield, CA 93308

APPL Inc.
908 North Temperance Avenue
Clovis, CA 93611

Attn: James Angell

Project: Racetrack Hill

ARF: 76199

Sample ID: Well 26B

APPL ID: AZ14952

Sample Collection Date: 4/20/2015

QCG: #TPHD-150423A-196288

Method	Analyte	Result	PQL	MDL	Units	Extraction Date	Analysis Date
EPA 8015B-	DIESEL FUEL	100 ++	50.0	40.40	ug/L	04/23/15	04/24/15
EPA 8015B-	SURROGATE: OCTACOSANE (S)	82.9	28-142		%	04/23/15	04/24/15
EPA 8015B-	SURROGATE: ORTHO-TERPHENYL (	67.6	49-128		%	04/23/15	04/24/15

++(T3M) The analyst has noted that the chromatogram of this sample is mainly higher boiling hydrocarbons.

Quant Method: TPHD121.M
Run #: 424018
Instrument: Apollo
Sequence: 150424
Dilution Factor: 1
Initials: LA

Printed: 5/7/2015 11:06:53 AM
APPL-F1-SC-NoMC-REG MDLs

May 21, 2015

Kenneth D. Schmidt & Assoc.
3701 Pegasus Dr., Suite #112
Bakersfield, CA 93308

Lab ID : VI 1541268-004
Customer ID : 4-17878

Sampled On : April 21, 2015-08:45
Sampled By : James Angell
Received On : April 22, 2015-11:30
Matrix : Drinking Water

Description : Well 24J
Project : Race Track Hill

Sample Result - Inorganic

Constituent	Result	PQL	Units	MCL/AL	Sample Preparation Method	Sample Preparation Date/ID	Sample Analysis Method	Sample Analysis Date/ID
Irrigation SuitP:1								
Total Hardness as CaCO3	276	--	mg/L		200.7	05/18/15:205769	200.7	05/18/15:207384
Calcium	71	1	mg/L		200.7	05/18/15:205769	200.7	05/18/15:207384
Magnesium	24	1	mg/L		200.7	05/18/15:205769	200.7	05/18/15:207384
Potassium	5	1	mg/L		200.7	05/18/15:205769	200.7	05/18/15:207384
Sodium	35	1	mg/L		200.7	05/18/15:205769	200.7	05/18/15:207384
Total Cations	7.2	--	meq/L		200.7	05/18/15:205769	200.7	05/18/15:207384
Boron	ND	0.1	mg/L		200.7	05/18/15:205769	200.7	05/18/15:207384
Copper	ND	10	ug/L	1000[2]	200.7	05/18/15:205769	200.7	05/18/15:207384
Iron	ND	30	ug/L	300[2]	200.7	05/18/15:205769	200.7	05/18/15:207384
Manganese	ND	10	ug/L	50[2]	200.7	05/18/15:205769	200.7	05/18/15:207384
Zinc	ND	20	ug/L		200.7	05/18/15:205769	200.7	05/18/15:207384
Gypsum Requirement	0.05	--	Tons/AF		200.7	05/18/15:205769	200.7	05/18/15:207384
SAR	0.9	--	--		200.7	05/18/15:205769	200.7	05/18/15:207384
Total Alkalinity	210	10	mg/L		2320B	04/28/15:204904	2320B	04/28/15:206334
Hydroxide	ND	10	mg/L		2320B	04/28/15:204904	2320B	04/28/15:206334
Carbonate	ND	10	mg/L		2320B	04/28/15:204904	2320B	04/28/15:206334
Bicarbonate	260	10	mg/L		2320B	04/28/15:204904	2320B	04/28/15:206334
Sulfate	95	2	mg/L	500[2]	300.0	04/22/15:204880	300.0	04/23/15:206326
Chloride	20	1	mg/L	500[2]	300.0	04/22/15:204880	300.0	04/23/15:206326
Nitrate	15.6	0.5	mg/L	45	300.0	04/22/15:204880	300.0	04/23/15:206326
Nitrate Nitrogen	3.5	0.1	mg/L	10	300.0	04/22/15:204880	300.0	04/23/15:206326
Fluoride	0.3	0.1	mg/L	2	300.0	04/22/15:204880	300.0	04/23/15:206326
Total Anions	7.1	--	meq/L		2320B	04/28/15:204904	2320B	04/28/15:206334
pH	7.4	--	units		4500-H B	04/23/15:204734	4500HB	04/23/15:206085
E. C.	667	1	umhos/cm	1600[2]	2510B	04/23/15:204719	2510B	04/23/15:206051
TDS by Summation	526	--	mg/L		200.7	05/18/15:205769	200.7	05/18/15:207384
Wet ChemistryP:1								
Solids, Total Dissolved (TDS)	440	20	mg/L	1000[2]	2540CE	04/23/15:204727	2540C	04/24/15:206120

ND=Non-Detected. PQL=Practical Quantitation Limit. Containers: (P) Plastic Preservatives: N/A ‡Surrogate. * PQL adjusted for dilution.
MCL = Maximum Contamination Level. 2 - Secondary Standard. 3 - CDPH Notification Level. AL = Regulatory Action Level.

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EPA 8015B TPH Diesel Water

Kenneth D. Schmidt & Assoc.
3701 Pegasus Dr., Ste 112
Bakersfield, CA 93308

APPL Inc.
908 North Temperance Avenue
Clovis, CA 93611

Attn: James Angell

Project: Racetrack Hill

ARF: 76199

Sample ID: Well 24J

APPL ID: AZ14955

Sample Collection Date: 4/21/2015

QCG: #TPHD-150423A-196288

Method	Analyte	Result	PQL	MDL	Units	Extraction Date	Analysis Date
EPA 8015B-	DIESEL FUEL	Not detected	50.0	40.40	ug/L	04/23/15	04/24/15
EPA 8015B-	SURROGATE: OCTACOSANE (S)	82.9	28-142		%	04/23/15	04/24/15
EPA 8015B-	SURROGATE: ORTHO-TERPHENYL (	64.0	49-128		%	04/23/15	04/24/15

Quant Method: TPHD121.M
Run #: 424021
Instrument: Apollo
Sequence: 150424
Dilution Factor: 1
Initials: LA

Printed: 5/7/2015 11:06:53 AM
APPL-F1-SC-NoMC-REG MDLs

April 22, 2015

Lab ID : VI 1541145-001
Customer ID : 4-17878

Kenneth D. Schmidt & Assoc.
3701 Pegasus Dr., Suite #112
Bakersfield, CA 93308

Sampled On : April 9, 2015-16:10
Sampled By : Dee Jaspar
Received On : April 11, 2015-14:11
Matrix : Ag Water

Description : T29S/R29E-16H
Project : Race Track Hill

Sample Result - Inorganic

Constituent	Result	PQL	Units	Note	Sample Preparation Method	Sample Preparation Date/ID	Sample Analysis Method	Sample Analysis Date/ID
Irrigation Suit P:1								
Total Hardness as CaCO3	66.5	--	mg/L		200.7	04/14/15:204307	200.7	04/14/15:205660
Calcium	25	1	mg/L		200.7	04/14/15:204307	200.7	04/14/15:205660
Magnesium	1	1	mg/L		200.7	04/14/15:204307	200.7	04/14/15:205660
Potassium	2	1	mg/L		200.7	04/14/15:204307	200.7	04/14/15:205660
Sodium	99	1	mg/L		200.7	04/14/15:204307	200.7	04/14/15:205660
Total Cations	5.7	--	meq/L		200.7	04/14/15:204307	200.7	04/14/15:205660
Boron	0.2	0.1	mg/L		200.7	04/14/15:204307	200.7	04/14/15:205660
Copper	ND	10	ug/L		200.7	04/14/15:204307	200.7	04/14/15:205660
Iron	190	30	ug/L		200.7	04/14/15:204307	200.7	04/14/15:205660
Manganese	290	10	ug/L		200.7	04/14/15:204307	200.7	04/14/15:205660
Zinc	90	20	ug/L		200.7	04/14/15:204307	200.7	04/14/15:205660
Gypsum Requirement	0.7	--	Tons/AF		200.7	04/14/15:204307	200.7	04/14/15:205660
SAR	5.3	--	--		200.7	04/14/15:204307	200.7	04/14/15:205660
Total Alkalinity	140	10	mg/L		2320B	04/14/15:204293	2320B	04/14/15:205530
Hydroxide	ND	10	mg/L		2320B	04/14/15:204293	2320B	04/14/15:205530
Carbonate	ND	10	mg/L		2320B	04/14/15:204293	2320B	04/14/15:205530
Bicarbonate	170	10	mg/L		2320B	04/14/15:204293	2320B	04/14/15:205530
Sulfate	18	2	mg/L		300.0	04/17/15:204570	300.0	04/17/15:206004
Chloride	75	1	mg/L		300.0	04/17/15:204570	300.0	04/17/15:206004
Nitrate	ND	0.5	mg/L		300.0	04/17/15:204570	300.0	04/17/15:206004
Nitrate Nitrogen	ND	0.1	mg/L		300.0	04/17/15:204570	300.0	04/17/15:206004
Fluoride	0.2	0.1	mg/L		300.0	04/17/15:204570	300.0	04/17/15:206004
Total Anions	5.3	--	meq/L		2320B	04/14/15:204293	2320B	04/14/15:205530
pH	7.5	--	units		4500-H B	04/14/15:204321	4500HB	04/14/15:205559
E. C.	570	1	umhos/cm		2510B	04/13/15:204272	2510B	04/13/15:205507
TDS by Summation	390	--	mg/L		200.7	04/14/15:204307	200.7	04/14/15:205660
Metals, Diss P:1								
Arsenic	4	2	ug/L		200.8	04/14/15:204303	200.8	04/14/15:205578
Wet Chemistry P:1								
Solids, Total Dissolved (TDS)	310	20	mg/L		2540CE	04/14/15:204320	2540C	04/15/15:205579

ND=Non-Detected. PQL=Practical Quantitation Limit. Containers: (AVT) Amber VOA TFE-Cap, (P) Plastic Preservatives: H2SO4 pH < 2 ‡Surrogate. * PQL adjusted for dilution.

Corporate Offices & Laboratory
853 Corporation Street
Santa Paula, CA 93060
TEL: (805)392-2000
Env FAX: (805)525-4172 / Ag FAX: (805)392-2063
CA ELAP Certification No. 1573

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9415 W. Goshen Avenue
Visalia, CA 93291
TEL: (559)734-9473
FAX: (559)734-8435
CA ELAP Certification No. 2810

April 22, 2015

Lab ID : VI 1541145-001
Customer ID : 4-17878

Kenneth D. Schmidt & Assoc.
3701 Pegasus Dr., Suite #112
Bakersfield, CA 93308

Sampled On : April 9, 2015-16:10
Sampled By : Dee Jaspar
Received On : April 11, 2015-14:11
Matrix : Ag Water

Description : T29S/R29E-16H
Project : Race Track Hill

Sample Result - Organic

Constituent	Result	PQL	Units	Note	Sample Preparation		Sample Analysis	
					Method	Date/ID	Method	Date/ID
TOC AVT:1'4								
TOC	0.8	0.5	mg/L		5310C	04/14/15:204285	5310C	04/14/15:205596

ND=Non-Detected. PQL=Practical Quantitation Limit. Containers: (AVT) Amber VOA TFE-Cap, (P) Plastic Preservatives: H2SO4 pH < 2 ‡Surrogate. * PQL adjusted for dilution.

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TEL: (559)734-9473
FAX: (559)734-8435
CA ELAP Certification No. 2810

EPA 8015B TPH Diesel Water

Kenneth D. Schmidt & Assoc.
3701 Pegasus Dr., Ste 112
Bakersfield, CA 93308

APPL Inc.
908 North Temperance Avenue
Clovis, CA 93611

Attn: James Angell

Project: RACETRACK HILL

ARF: 76093

Sample ID: T29S/R29E-16H

APPL ID: AZ14417

Sample Collection Date: 4/9/2015

QCG: #TPHD-150413A-195915

Method	Analyte	Result	PQL	Units	Extraction Date	Analysis Date
EPA 8015B-	DIESEL FUEL	Not detected	50.0	ug/L	4/13/2015	4/14/2015
EPA 8015B-	SURROGATE: OCTACOSANE (S)	69.0	28-142	%	4/13/2015	4/14/2015
EPA 8015B-	SURROGATE: ORTHO-TERPHENYL (S)	65.6	49-128	%	4/13/2015	4/14/2015

Quant Method:	TPHD121.M
Run #:	413090
Instrument:	Apollo
Sequence:	150413
Dilution Factor:	1
Initials:	LA

Printed: 4/24/2015 2:04:45 PM
Form 1 - APPL Standard GC - No MC

Kennedy/Jenks Consultants
303 Second Street, Suite 300
San Francisco, CA 94107

Reported: 06/19/2015 14:56
Project: Race Track Hill
Project Number: 1365027*00
Project Manager: Stuart Childs

Water Analysis (General Chemistry)

BCL Sample ID: 1514100-01 **Client Sample Name:** Nickels Unused Well, 6/9/2015 6:30:00AM, R. Prince

Constituent	Result	Units	PQL	MDL	Method	MB Bias	Lab Quals	Run #
Dissolved Calcium	**110**	**mg/L**	**0.10**	**0.016**	**EPA-200.7**	0.016		1
Total Recoverable Calcium	**120**	**mg/L**	**0.10**	**0.014**	**EPA-200.7**	ND		2
Dissolved Magnesium	**32**	**mg/L**	**0.050**	**0.019**	**EPA-200.7**	ND		1
Total Recoverable Magnesium	**33**	**mg/L**	**0.050**	**0.019**	**EPA-200.7**	ND		2
Dissolved Sodium	**67**	**mg/L**	**0.50**	**0.051**	**EPA-200.7**	ND		1
Total Recoverable Sodium	**68**	**mg/L**	**0.50**	**0.051**	**EPA-200.7**	0.052		2
Dissolved Potassium	**8.8**	**mg/L**	**1.0**	**0.10**	**EPA-200.7**	ND		1
Total Recoverable Potassium	**9.2**	**mg/L**	**1.0**	**0.10**	**EPA-200.7**	ND		2
Bicarbonate Alkalinity as CaCO3	**290**	**mg/L**	**4.1**	**4.1**	**EPA-310.1**	ND		3
Carbonate Alkalinity as CaCO3	ND	mg/L	4.1	4.1	EPA-310.1	ND		3
Alkalinity as CaCO3	**290**	**mg/L**	**4.1**	**4.1**	**Calc**	ND		4
Chloride	**42**	**mg/L**	**0.50**	**0.061**	**EPA-300.0**	ND		5
Nitrate as N	**0.51**	**mg/L**	**0.10**	**0.018**	**EPA-300.0**	ND		6
Sulfate	**200**	**mg/L**	**1.0**	**0.10**	**EPA-300.0**	ND		5
pH	**7.47**	**pH Units**	**0.05**	**0.05**	**EPA-150.1**		**S05**	7
Electrical Conductivity @ 25 C	**977**	**umhos/cm**	**1.00**	**1.00**	**EPA-120.1**			8
Total Dissolved Solids @ 180 C	**680**	**mg/L**	**33**	**33**	**SM-2540C**	ND		9
Non-Volatile Organic Carbon	**0.77**	**mg/L**	**1.0**	**0.30**	**EPA-415.1**	ND	**J**	10

Run #	Method	Prep Date	Run Date/Time	Analyst	Instrument	Dilution	QC Batch ID
1	EPA-200.7	06/10/15	06/18/15 16:45	JRG	PE-OP2	1	BYF1638
2	EPA-200.7	06/11/15	06/15/15 17:21	JRG	PE-OP2	1	BYF1127
3	EPA-310.1	06/11/15	06/11/15 15:46	RML	MET-1	1	BYF1110
4	Calc	06/10/15	06/16/15 14:23	MSA	Calc	1	BYF1029
5	EPA-300.0	06/09/15	06/10/15 11:34	OLH	IC1	1	BYF0917
6	EPA-300.0	06/09/15	06/10/15 04:16	OLH	IC1	1	BYF0917
7	EPA-150.1	06/11/15	06/11/15 15:46	RML	MET-1	1	BYF1110
8	EPA-120.1	06/11/15	06/11/15 15:46	RML	MET-1	1	BYF1110
9	SM-2540C	06/12/15	06/12/15 09:30	CAD	MANUAL	3.333	BYF1047
10	EPA-415.1	06/10/15	06/10/15 22:19	ALW	TOC2	1	BYF0923

Kennedy/Jenks Consultants
303 Second Street, Suite 300
San Francisco, CA 94107

Reported: 06/19/2015 14:56
Project: Race Track Hill
Project Number: 1365027*00
Project Manager: Stuart Childs

Metals Analysis

BCL Sample ID: 1514100-01 **Client Sample Name:** Nickels Unused Well, 6/9/2015 6:30:00AM, R. Prince

Constituent	Result	Units	PQL	MDL	Method	MB Bias	Lab Quals	Run #
Dissolved Arsenic	ND	ug/L	50	9.2	EPA-200.7	ND		1
Dissolved Boron	**140**	**ug/L**	**100**	**10**	**EPA-200.7**	ND		1
Total Recoverable Arsenic	**8.7**	**ug/L**	**50**	**7.8**	**EPA-200.7**	ND	**J**	2
Total Recoverable Boron	**130**	**ug/L**	**100**	**10**	**EPA-200.7**	ND		2

Run #	Method	Prep Date	Run Date/Time	Analyst	Instrument	Dilution	QC Batch ID
1	EPA-200.7	06/10/15	06/16/15 17:15	JRG	PE-OP2	1	BYF0991
2	EPA-200.7	06/11/15	06/15/15 17:21	JRG	PE-OP2	1	BYF1127

Kennedy/Jenks Consultants	**Reported:**	06/19/2015 14:56
303 Second Street, Suite 300	Project:	Race Track Hill
San Francisco, CA 94107	Project Number:	1365027*00
	Project Manager:	Stuart Childs

Total Petroleum Hydrocarbons

BCL Sample ID: 1514100-01 **Client Sample Name:** Nickels Unused Well, 6/9/2015 6:30:00AM, R. Prince

Constituent	Result	Units	PQL	MDL	Method	MB Bias	Lab Quals	Run #
TPH - Crude Oil	ND	ug/L	500	140	EPA-8015B/FFP	ND		1
Tetracosane (Surrogate)	48.1	%	37 - 134 (LCL - UCL)		EPA-8015B/FFP			1

Run #	Method	Prep Date	Run Date/Time	Analyst	Instrument	Dilution	QC Batch ID
1	EPA-8015B/FFP	06/11/15	06/13/15 07:05	MWB	GC-13	1	BYF1189

Appendix E

Monthly Produced Water Flows for 2010 Through 2014

Appendix E: Monthly Produced Water Flows for 2010-2014

Month	Produced Water Discharge (Barrels) 2010	2011	2012	2013	2014	Monthly Average
January	211,574	208,592	235,406	355,300	342,775	270,729
February	229,028	214,623	250,248	287,241	281,083	252,445
March	226,744	266,462	323,768	278,204	261,989	271,433
April	267,417	192,062	259,062	278,629	269,642	253,362
May	234,459	192,770	317,935	370,099	343,851	291,823
June	222,473	196,193	241,982	329,681	272,890	252,644
July	274,625	259,834	262,594	283,982	329,612	282,129
August	215,496	192,332	312,376	356,806	258,407	267,083
September	268,847	266,065	264,141	296,558	260,492	271,221
October	212,438	224,264	271,794	364,651	316,547	277,939
November	194,035	249,071	317,012	283,582	241,668	257,074
December	250,108	309,864	280,357	266,827	277,157	276,863
Annual Total	**2,807,244**	**2,772,132**	**3,336,675**	**3,751,560**	**3,456,113**	

Appendix F

Report on Runoff Conditions
at the Race Track Hill Facility, Kern County, CA

DEE JASPAR & ASSOCIATES, INC.
CONSULTING CIVIL ENGINEERS
2730 UNICORN ROAD, BUILDING A
BAKERSFIELD, CA 93308
PHONE (661) 393-4796
FAX (661) 393-4799

June 29, 2015

Report on Storm Runoff Conditions at the Racetrack Hill Facility
Kern County, CA

- The Racetrack Hill facility is located on 240 acres in Section 24, T.29S. R.29E. M.D.B.&M. This report estimates the runoff from the hills surrounding the facility to determine if water can be contained by the ponds within the facility.
- The facility is depicted on the attached map. Ponds are superimposed on an aerial photo of the facility. USGS Quadrangle sheets, and contours on the Kern County GIS website were used to delineate the drainage areas. The size of the drainage areas and ponds were developed using the tools on the County website.
- Drainage volumes were estimated from the Kern County Hydrology Manual and the SCS (now NRCS) Bulletin SCS-TP-149. Parameters selected for the site were from the Kern County Hydrology Manual and were as follows:
- 100 Year 24 Hour Precipitation: P = 3.00 inches
- SCS Curve Number: 75
- Total soil capacity: S = 3.33
- Initial abstract: Ia = 0.67"
- Net runoff volumes were estimated from the formula: $Y = (P-Ia)^2/(P-Ia+S) = 0.96"$ (0.08')
- The attached calculation sheet develops the storm yield by area.

It is noted that the maximum 1-day rainfall event in Bakersfield was 2.29". The 24-hour 100 year precipitation amount calculated by the Hydrology Manual of 3.00" was used for this study. The effects of a long-term rainfall were not considered in this report.

The calculation that follows shows that the ponds in each drainage area are capable of containing the maximum 24 hour 100 year event runoff if they are operated with the minimum freeboard that is calculated. This assumes that the interconnections of the ponds (pond overflow piping and connective channels) are capable of transporting the drainage flows. Although it was not addressed by this study, it appears that the connective piping, channels, etc., have been adequate for the past 50 or so years that the facility has been operated as evidenced by the absence of runoff from the site (by inspection of historical photos), and no pond levee failures. Additional flows from longer term rainfall events can be managed by adjusting pond freeboard amounts, and by dewatering certain ponds prior to the rainy season to provide storage space for runoff.

Area #1 (105.5 acres) drains to the east. It is the northern-most area. Area #1 has a significant number of ponds in the central drainage valley and in the small canyons on the north side of the valley. The contributing area is steep and runoff occurs quite rapidly. Soils are moderately permeable. The Map Unit is 185- Brecken-Cuyama-Pleito complex. This soil type is common to all the drainage areas in the 240- acre facility.

Area #2 (43.9 acres) also drains to the east into Area #3 (23.6 acres). Slopes are steep and soils moderately permeable. The soils support salt-tolerant grasses, trees and shrubs. Soil series is partly 185 (above) and 192 Chanac-Pleito complex in Area #2, and 185 in Area #3.

Area #4 (36.5 acres) drains towards the south but pond capacity is adequate to keep all waters within the boundaries of the facility. Soils slopes are steep. Soils are 185 – Breken-Cuyama-Pleito, moderately permeable.

Area #5 (52.2 acres) on the east side of the facility has minimal storage, amounting to less than an acre-foot. Soil classification is 185. Moderately permeable. Slopes are steep on the west side of the area, steep to moderately sloping on the east portion of the area. Area #5 is also subject to runoff from the lands east of Breckenridge Road (Area #6). Area #6 (30.8 acres) discharges into a drainage channel located on the west side of the road in Area #5 via an 18-inch culvert pipe. Facility operators have stated that during heavy runoff events booster pumps are used to intercept water travelling along the west side of Breckenridge Road. This water is then pumped to vacant uphill ponds, thereby utilizing unused storage space and freeboard.

Therefore it appears that no water leaves the site during rainfall events. It is my opinion that this is due to provision of storage space in the ponds and utilizing pumping when necessary during the rainy season.

Dee Jaspar, P.E.

REGISTERED PROFESSIONAL ENGINEER
DEE JASPAR
No. C 23042
Exp. 12-31-15
CIVIL
STATE OF CALIFORNIA

Runoff Estimate for the Racetrack Hill Facility

Information from the Kern County Hydrology Manual

100 year 24 Hour Precipitation = 3.00”

SCS Curve Number 75

S = (1000/CN)-10 = 3.33

Ia = 0.2 S = 0.67”

Y = $(P - Ia)^2/(P - Ia + S)$ = 0.96” = 0.08’

Runoff Calculations by Area

Area #13.5+1.9

Total Area = 103.5 acres

West & Middle Areas

Area = 76.0 acres

Runoff Yield = 6.1 acre-feet

Pond Area = 6.1 acres

Required freeboard in all ponds = 12” (assuming adequate connectivity)

East Area

Area = 27.5 acres

Runoff Yield = 2.2 acre-feet

Pond Area = 2.0 acres

Required freeboard in all ponds = 14”

Area #2

Area = 43.9 acres

Runoff Yield = 3.5 acre-feet

Pond Area = 3.6 acres

Required freeboard in all ponds = 12”

Area #3

Area = 23.6 acre

Runoff Yield = 1.9 acre-feet

Pond Area = 5.0 acres

Required freeboard in all ponds = 5"

Area #4

This area drains to the south

Area = 36.5 acres

Runoff Yield = 2.9 acre-feet

Pond Area = 3.8 acres

Required freeboard in all ponds = 9"

Area #5

Area = 52.2 acres

Runoff Yield = 4.2 acre-feet

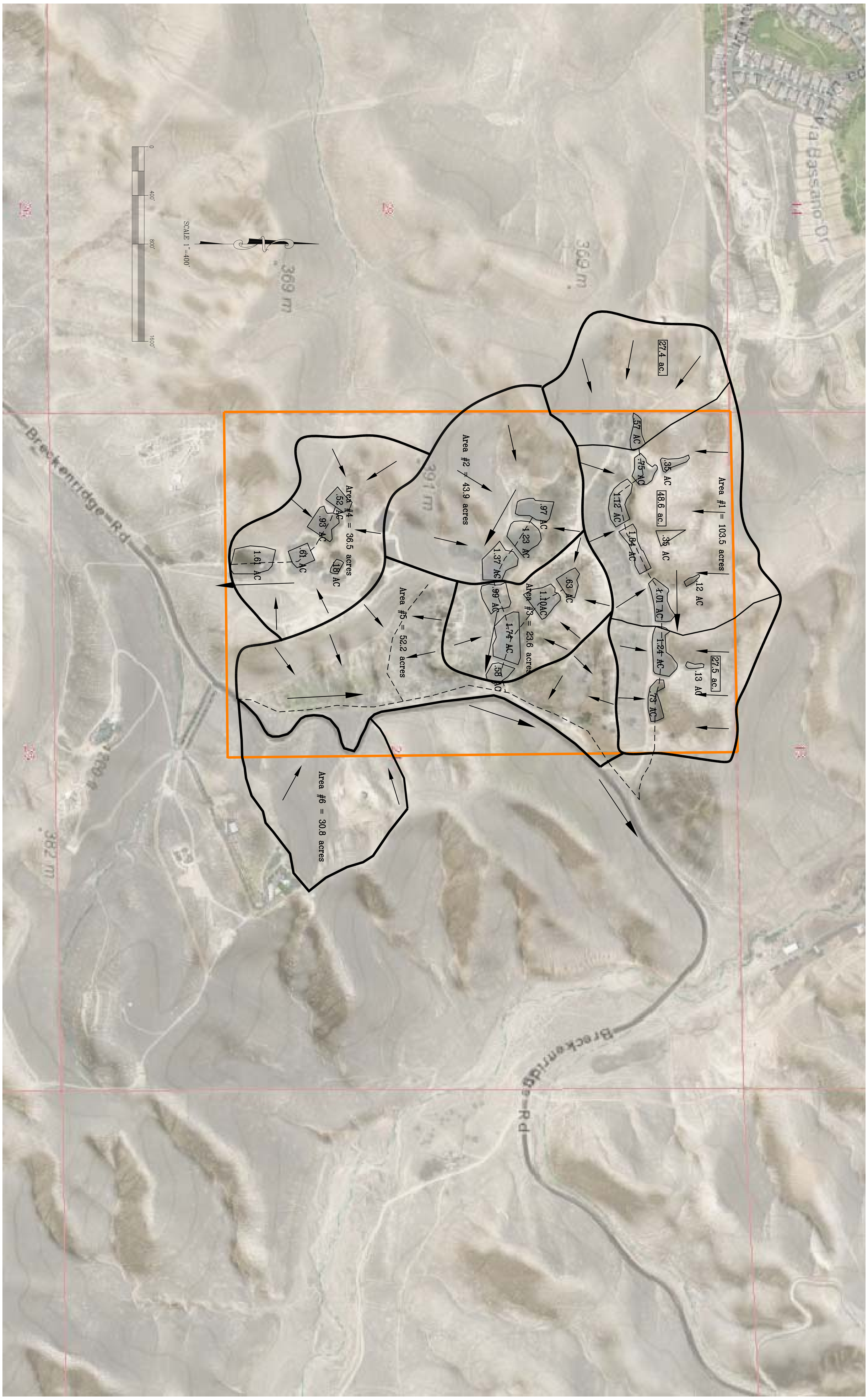
Pond Area = 0.36 acres

Area #6

This area is east of Breckenridge Road

Area = 30.8 acres contributing to Area #5

Runoff Yield = 2.5 acre-feet



RACETRACK HILL

FLOOD STUDY

VALLEY WATER MANAGEMENT
KERN COUNTY, CALIFORNIA

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CIVIL • ENGINEERS
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15 W. PUTNAM AVENUE, 2ND FLOOR
PORTERVILLE, CALIFORNIA 93257
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CHECKED	DJA
DATE	
DATE	
SCALE	AS SHOWN
FILE	
JOB NO.	
SHEET	1
OF	1 SHEETS

REVISION	BY